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# **USSR Report**

## **HUMAN RESOURCES**

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14 June 1984

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LABOR

LABOR OFFICIAL ANALYZES SCIENTIFIC PERSONNEL WAGE SYSTEM

Moscow SOTSIALISTICHESKIY TRUD in Russian No 1, Jan 84 pp 28-37

[Article by N. Yakovchyk, deputy chief of the Department of Control Apparatus, Scientific, Design and Planning Organizations of the USSR State Committee for Labor and Social Problems, candidate of economics: "The Work and Wage of the Scientist (On the Results of an Experiment in 67 Scientific Research Institutions)"]

[Text] A Little History

Scientific work, by its character, belongs to the number of those types of human activity in which it is rather difficult, and at times almost impossible, to accurately measure the quantity and assess the quality of the work invested by the worker in the achievement of a certain scientific result. For a long time it was therefore thought that the realization of the socialist principle of the payment of work in science is possible only on the basis of the consideration of the external attributes of the scientist: The presence or absence of an academic degree, the magnitude of scientific-pedagogical service and the position held, as well as the category in which the given institute is included with respect to the payment of the work of staff members depending on the scale and the national economic significance of the problems being solved by it.

The wage system in science that has developed since 1957, which guarantees an automatic increase in the wage of a scientist after the conferment of an academic degree or the transfer to the next length-of-service group, is giving rise to a considerable amount of justifiable criticism. Its main shortcoming -- the absence of any kind of connection of the dimension of the pay of the researcher with the results of his work--has in many cases become the reason for the weakening of the interest of the scientists and specialists of the scientific institutions in the efficiency of the research and developments being carried out and in the acceleration of their utilization in economic practice.

In many sectors of the national economy there has been an excessive growth in the number of workers engaged in science and in scientific service. From 1965 to 1981 it increased for the country as a whole from 2.4 to 4.5 million. From year to year there has also been an increase in expenditures for the

conduct of scientific research. During 10 years the average annual expenditures for science from the state budget increased from 15 to 24 billion rubles. At the same time, the economic effect of the introduction of research and developments calculated per person employed in science and in scientific maintenance is growing insignificantly, and calculated per ruble of expenditures it remains unchanged for a long time, even diminishing in a number of industries.

Of significant interest against this background are the results of an experimental system of wages for the personnel of scientific research institutes in accordance with the efficiency of their work as exemplified by the Physical Chemistry Scientific Research Institute imeni L. Ya. Karpov of the Ministry of the Chemical Industry.

Fifteen years ago, on the initiative of the director of this Institute, Academician Ya. M. Kolotyrkin, supported at the time by the Minister of the Chemical Industry, L. A. Kostandov, the State Committee for Labor and Social Problems developed and, with the permission of the USSR Council of Ministers, introduced by way of an experiment in the Institute imeni L. Ya. Karpov, a system of wages in which the scale of the wages for scientists began to depend not only on titles and positions, but also on the effectiveness of their scientific activity. Already the first results proved to be exceedingly hopeful. For this reason, 8 more institutes were transferred to the experimental system during the next two years.

At the present time, the "Karpov" system is used in 67 institutes of 33 ministries and departments of the USSR and the union republics. About 62,000, or almost 3 percent of the total number of the personnel of the scientific-research organizations of the country, are employed in these institutes.

#### In the Mirror of Figures

In 1982 the USSR State Committee for Labor and Social Problems, jointly with the Scientific Research Institute of Labor, as well as with the participation of the USSR State Committee for Science and Technology, the USSR Academy of Sciences, the Ministry of the Chemical Industry and other interested ministries and departments, generalized the results of the use of the experimental system for a protracted period. In May 1983 the results of the experiment were discussed at a session of the USSR State Committee for Labor and Social Problems, in which representatives of ministries, departments, and the directors of scientific research institutes took part.

#### What are the main results of the experiment?

The analysis of the reports of the Scientific Research Institute and the reports of the ministries and departments participating in the experiment showed that the application of the new system secured the reinforcement of the interest of the scientists and specialists in the results of their work, significantly increased the efficiency of research and developments. Thus, during the 10th Five-Year-Plan the volume of scientific research work in the 67 "Karpov" institutes increased by 21.6 percent, while the number of personnel increased only by 4 percent.

Most indicative are the data for the institutes in which the experimental system has been used for more than 10 years, for during this time a whole cycle of work on many subjects was carried out from the beginning of the research to the introduction of the results in practice. There are 39 such institutes which operate in the conditions of the experiment for more than two five-year-plans. The summary annual economic effect from the introduction of their developments grew significantly more rapidly than the volume of scientific research work. During 1970-1980 the volume of work carried out here increased by 70 percent, and the annual economic effect increased by a factor of 2.8. In its turn, the volume of scientific-research work here increased at more rapid rates compared to the number of personnel, which during 10 years increased only by 16.6 percent. The economic effect calculated per ruble of expenditures increased almost by a factor of 1.7 in these institutes.

The wages of the personnel of the institutes using the "Karpov" system for more than 10 years grew by almost 40 percent, and the effectiveness of the introduction of the research and developments calculated per ruble of wages --by 84 percent. For comparison it is interesting to remember that for science as whole (for the range of organizations governed by the USSR State Committee for Science and Technology) the wages of the personnel for this same period increased by 29 percent, and the indicators of efficiency per ruble of wages practically did not change.

By virtue of what levers influencing the efficiency of the work of scientific institutions were such results attained?

#### "Three Pillars" of the Karpov System

The mechanism of the "Karpov" system is sufficiently widely known. For this reason, without going into a detailed description of the entire system, we shall recall here only the essence of its basic elements.

1. A flexible system of salaries of scientists and specialists. For every position scales of minimum (guaranteed) and maximum attainable salaries are established. Their maximum rates are established on the average 25 percent lower or higher than the corresponding salaries according to the schemes operative in all the remaining scientific research institutions. The absolute differences between the minimum and maximum salaries for one and the same position according to the conditions of the experiment at times reach 200-250 rubles. Thus, the salary of the chief of a department, sector or laboratory of a scientific research institute with the degree of doctor of science may come to 300 to 550 rubles a month, with the degree of candidate of science in the same position--from 225 to 450 rubles. For the chief of a department, a laboratory or a sector of a scientific research institute, who does not have an academic degree, a salary of 165 to 350 rubles a month may be established. The salaries of senior scientists with the doctor of science degree may be set within the limits of 250 to 450 rubles a month, the salaries of candidates of science--from 190 to 375 rubles.

For highly qualified personnel, on the quality of whose work higher demands are placed, as well as for some employees and auxiliary scientific personnel, increments within the limits of up to 30 percent of the wage or salary may be established for a certain period.

2. The actual size of the salary of a scientist or specialist is established by the results of periodic attestatior, which is conducted in several stages: At the level of the department, the qualification commission for scientific sector, the institute-wide attestation commission or the scientific council of the institute.

With the attestation of the scientific and engineering and technical personnel of the scientific research institutes operating in accordance with the "Karpov" system, thus, not only the conformity of this personnel to the position held is confirmed or not confirmed, but also the rates of their salaries are increased or decreased depending on the efficiency of the work of a given scientist during the inter-attestation period.

3. The wage fund approved for the institute prior to the transfer to the experiment is preserved unchanged, regardless of the reduction in the number of personnel. It can be changed only if there is a significant increase or decrease of the plan volume of scientific research work.

The right to confirm a proposal for a bonus payment to personnel of the institute is given to the director of the scientific research institute in agreement with the local committee of the trade union. The possibilities for bonus payments in the early stages of the experiment were expanded through using part of the savings of the wage fund for these purposes and as sectors of industry converted to the autonomous financing system of performing work with respect to new technology--from the funds received in the material incentive fund, which will be discussed below.

These elements constitute the basis of the experimental system of the wages in scientific institutions.

#### The Time Has Come to Answer the Opponents

It must be said that in the course of all of the 15 years of the experiment of the "Karpov" system there have been not only advocates and passionate defenders (primarily among those trying it out in practice). Some organizers of science met it with an attitude of reserve, and sometimes even with skepticism, and some scientists came out in the press with sharp criticism of this system.

The main "accusations" of the opponents reduced themselves to the following three items: a) The system induces the collectives of institutes to develop short-term, petty subjects, the results of which can be effectively presented during the next attestation; b) many scientists suffer undeservedly since, in order to secure raises in wages for some scientists, it will be necessary to lower the salaries for others; c) the attestation will provide space for arbitrariness and subjective assessments and generate a mass of conflicts.

The documents of the verification of the work of the institutes, the reports of ministries, and the statements of the directors of scientific collectives operating in the conditions of the experiment make it possible today, taking into account the 15-year experience of the practical application of the system, to reply to the arguments of the adversaries of the "Kar-pov" system already not in the language of emotion, but with precise facts and figures.

And thus, one after the other. Has the dependence of the salary rates of scientists on the efficiency of research generated an aspiration for petty, quickly-executable subjects, has it led to a reduction in the proportion of work on the most important subjects? We will say at once: These fears have proved to be unfounded. In the institutes in which the experiment began more than 10 years ago, the proportion of the work on special purpose and other programs approved by the USSR Council of Ministers, the USSR State Committee for Science and Technology, and the USSR Academy of Sciences increased from 20 to 26 percent, i. e., by almost one-third. The number of work operations (subjects) being carried out increased by 20 percent, and the volume of every development increased on the average by 41.5 percent.

In the institutes conducting mainly basic research, the share of work on special purpose and other programs increased more than twofold, the average annual volume of work on subjects (programs) being carried out--by a factor of 1.5. And although the subject range of the work became noticeably larger, the time for the execution of the individual subject did not increase. For all 67 institutes as a whole, the average time period for the execution and introduction of one work project decreased by approximately 25 percent.

Still more convincing are the data which testify to the enlargement of the subjects and the increase in the significance of the work being carried out, by the individual institutes. For example, in the State Scientific Research Institute of Nonferrous Metals the volume of scientific research work doubled during the years of the experiment, and the number of subjects being carried out decreased threefold in so doing. In the All-Union Scientific Research Institute of Thermal Insulation of the USSR Ministry of the Construction Materials Industry, in the presence of an increase in the volume of scientific research work by a factor of 3.7, the proportion of work on the most important subjects increased from 10 percent to 25 percent.

Now about increments to the guaranteed minimal salaries. The extraordinary wide "bracket" of salaries for one and the same position means that the rights of the directors of scientific research institutions in the sphere of determining the rate of the wages of personnel, taking into account the results of their work, have become significantly greater. How are they used in practice? The reports indicate: With every regular attestation, the directors of the scientific research institutes make increasingly more active use of these rights. If 10 years ago scientists, for whom salaries were set with deviations from the existing schemes, accounted for less than one-third of the total number of those attested, their number increased to 47.3 percent during the last attestation. Moreover, a reduction in salary as compared to the established scheme takes place for 1 of every 10 scientists who have gone through attestation. In return the salaries of 4 out of 10 are increased by comparison with the salaries according to established schemes. This trend is observed in all classification levels. Among the candidates of science, 10

percent in the last attestation received salaries lower than those according to established schemes, and 28 percent--higher salaries than they would have under the traditional system of wages. For doctors of science, these magnitudes came correspondingly to about 3 and 6 percent.

Many institutes and ministries perceive a large advantage of the "Karpov" system in the fact that it provides the possibility to attract highly-skilled specialists--engineers, designers, and technologists--from production into scientific organizations. This conclusion is also confirmed by the statistics of increments to guaranteed minimum salaries; almost 48 percent of the personnel without an academic degree in the last attestation received higher salaries than average salaries according to the established scheme. For less than 10 percent of the personnel without an academic degree, lowered salaries were set by comparison with the established scheme.

And thus, the number of scientists and specialists for salaries were increased is 4 times larger than those for whom they were reduced. The total sum in the amount of which salaries were increased in the attestation of 1980 came to 141,700 rubles per month. It exceeds almost fivefold the summary magnitude in the amount of which salaries were decreased. As we see, to say that the increase in the salaries for some is possible only by virtue of the reduction of the wages for other scientists is completely untrue. The basic source of the increase of the salaries for such a significant number of persons is the economy of the wage fund, generated by virtue of the improvement of the structure of the institutes, the abolition of small subdivisions and superfluous positions, as well as by virtue of an increase in the efficiency of work, the improvement of its organization, and the execution of growing volumes of work with the previous or smaller number of staff members.

Moreover, the absolute sum in the amount of which the salary of the scientist is lowered, is at times small. It amounts on the average to less than 20 rubles a month. Only for 2 percent of the personnel which went through attestation in 1980 did the deviations from the salary rates according to the established scheme exceed 40 rubles per month. Nevertheless, all directors of "Karpov" institutes, without exception, note the active and positive influence of the "floating" rate of the salary on the efficiency of the work of scientists. They emphasize that the lowering of the salary is an almost symbolic measure, it is rather of moral than material significance. It is not the fear of losing a ten-ruble note a month that trains and disciplines the scientist and serves as a powerful stimulant of labor activity but primarily the public social assessment of the labor of each individual scientist itself.

#### Are the Results of Work in Science Comparable?

The third argument of the opponents of the "Karpov" system: Attestation is harmful, since in science the individual work results cannot be compared to each other and, therefore, a reliable assessment of the quality of the work of individual members of the scientific collective are almost impossible.

Indeed, the general methodology of the assessment of scientific activity is rather poorly developed for the time being. There is not even unity in the ap-

proach to the main question: What should be assessed in the attestation--the scientist himself (his training, research and organizational abilities, public activity, etc.) or his scientific results for the inter-attestation period (scientific level of publications, theoretical and practical significance of developments, their originality, results of introduction, etc.).

In summing up the results of socialist competition, in the comparison of the results of the work of institutes of the same profile, and in the assessment of the activity of structural subdivisions and individual scientists, diverse systems of assessments are applied. Different scales (in numbers), questionnaires, expert findings, etc. have found dissemination. Sometimes these forms and questionnaires "begin" with rather accidental indicators, which are not always arranged in terms of their significance. In the enumeration of the information about staff members at times such general characteristics (for example, "abilities", "diligence") are included that the assessment of them for one and the same staff members by different people can differ very strongly, depending on the content which is imputed to a given concept by the person filling out the questionnaire.

The solution of the methodological questions, the generalization of the practice of the assessment of the activity of scientific collectives and their individual members, the development of scientifically-based recommendations for its improvement--these are urgent practical tasks. It seems necessary to us that already in the near future the scientific institutions of the USSR State Committee for Science and Technology, the Academy of Sciences, and the AUCCTU proceed with their solution.

The experience accumulated by the "Karpov" institutes, where regular attestation of scientific personnel and specialists has already been carried out for a long time is therefore of great value in these terms. In every institute a statute has been developed on the procedure of attestation, the forms of the attestation documents, the assessment criteria and the indicators, which are different for various categories of personnel and are frequently also coordinated with tasks confronting the collective in which the person being attested works.

The qualification commissions consist of the most authoritative representatives of the labor collective--outstanding scientists, party, trade union and Komsomol activists, and representatives of the administration. In large institutes there may be several such commissions--by scientific sectors. [As a rule, the director of a structural subdivision provides a preliminary assessment of the work of every staff member. In some institutes a democratic practice of discussing this assessment at production meetings of the department, laboratory or sector has developed.

During the second stage, the questionnaires filled out by the scientist and the director of the department are received for examination by the qualification commissions, where reports of the directors of subdivisions are heard, as well as objections by the person being attested, if he is not in agreement with the preliminary assessment. The commissions give recommendations to the director of the institute and the public organizations concerning the rates of the

salaries of staff members. The results of the attestation may be appealed by them to a higher level--the institute-wide committee, the scientific council or the director of the institute. A final decision is taken after the examination of the objections received.

It must be said that such a "three-layered" procedure secures the active participation of the labor collective in the assessment of the efficiency of the work of every member, insures against mistakes and is conducive to the fuller realization of the principle of payment according to work.

True, some directors of institutes complain that the process of the development of an objective assessment of the individual work results takes away a great deal of time. In some institutes the attestation procedure lasts an entire year: An enormous number of special forms, questionnaires, surveys and expert findings are filled out and examined. But in others--where the attestation forms are well thought out and the work is clearly organized--it occupies no more than 1.5 to 2 months. I shall cite the example of the Leningrad All-Union Scientific Research Institute of Petrochemical Processes. Carefully composed questionnaires are filled out here simultaneously by the entire institute in the course of one week. The work of the commissions and the subsequent examinations of complaints take up approximately another month. For the determination of the coefficient of the efficiency of the activity of the scientific staff members, comprehensive criteria have been established, which make it possible to assess the quality and terms of the fulfillment of the work, taking into account their difficulty; the introduction (its scale, the significance for the national economy, the stage to which the utilization of the development has been brought in practice); the success of investigative research, taking into account the qualifications and creative activity of the person being attested; the level of the organization of work in the section of the person being attested, etc.

All persons being attested are divided into three groups: Junior scientists, including senior engineers; senior scientists; directors of laboratories and departments. Proceeding from the character of the work and tasks before a given category of specialists, every group is given its "weight" coefficient for every criterion.

The criteria themselves include several components, and for every one of them the person being attested is given an assessment on a 100-point scale.

The justification of the assessment being given by an expert is contained here --which sharply reduces the expenditures of time for filling out tables and guarantees uniformity of approach to the results of the work of various staff members and, consequently, their comparability.

Along with the table form, other forms of assessments--expert or point-expert--are allowed in the institute.

All of the work on the assessment of the activity of more than 500 staff members of the All-Union Scientific Research Institute of Petrochemical Processes being attested is completed in the course of 5-6 weeks.

## Plus Bonus for the Final Result

The "Karpov" system also introduced quite a number of important and unique details into the practice of bonus payments for scientists.

It does not constitute a great secret that in many scientific institutions the practice of material incentive reduces itself to the distribution of the bonus "pie" to all equally, i. e., in equal percent of the salaries of the staff members. The bonus in this case serves as a kind of permanent "makeweight" added to the basic wage, which does not play any stimulating role.

According to the conditions of the "Karpov" experiment, the bonus provisions are approved by the directors of the institutes themselves. In the majority of cases, these provisions are aimed at the preferential encouragement of those scientists and development engineers who make the greatest contribution to the cause of scientific-technical progress. Thus, in the Scientific Research Institute of Organic Semi-Products and Dyes, the material incentives fund is expended mainly for bonuses for fundamentally new technical solutions. As a result, in the presence of an average annual rate of bonuses for the institute within the range of 9-10 percent of the wage fund, for staff members of some structural subdivisions who attained the best results, it comes to 40 percent and more of the salaries calculated per year. In the institutes of the Academy of Sciences of the LaSSR, the authors of works, which have been victorious in internal competitions held twice a year, receive the right to bonuses. In the State Scientific Research Institute of Nonferrous Metals, too, a significant part of the bonus fund is designated for the encouragement of authors of works acknowledged as best according to the results of competitions: For the best work with respect to the creation and introduction of new technology; for the best theoretical, investigative or methodological work; and for the best work of a young specialist.

In the majority of institutes, the bonus provisions, as well as the criteria accepted for the determination of the rates of increments to the guaranteed minimum salaries, orient the collective toward a closer link with practice and a broad application of the results of theoretical research in the national economy. This had a salutary effect on the results of the work of scientific collectives. For example, among the scientists of the Institute of Organic Synthesis of the LaSSR Academy of Sciences, engaged in basic research, there has been an increased interest in the development of the technology of production. During the years of the experiment, the number of patents received abroad for the developments of the institute has tripled, and the period of the mastery of the production of new preparations has decreased on the average by 3 years.

A number of institutes (the Physical Chemistry Scientific Research Institute imeni L. Ya. Karpov, the Central Aerogeological Observatory, the Scientific Research Institute of Organic Semi-Products and Dyes, the Scientific Research Institute of Polymer Mechanics, and others), which previously had not carried out work for which an economic effect could be calculated, in 1980 obtained it in an amount which exceeded the annual magnitude of the expenditures for their maintenance.

During the period of the experiment, 42 of the 67 "Karpov" institutes made the transition to the autonomous financing system of carrying out work with respect to new technology on the basis of supply orders and the encouragement of research scientists and development engineers in accordance with the real economic effect received from the introduction of technical innovations. Fears were expressed that these two systems of wages can come into conflict with each other. However, this did not happen. On the contrary. The flexible system of salaries, the size of which is determined by the results of the work of the research scientists and development engineers, was harmoniously supplemented by a system of material incentive, which guaranteed also the link of the second, non-basic part of the wages of the personnel of scientific institutions--the bonus reward--with the efficiency of the research being carried out and the introduction of its results in practice.

According to the testimony of A. Yu. Kaminskas, director of the All-Union Scientific Research Institute of Thermal Insulation, in which during the time of the experiment, the volume of scientific research work increased by a factor of 3.7, and the economic effect increased by a factor of almost 9, such results are attained thanks to the simultaneous application of the "Karpov" system and the contract [khodzdogovor] system of the organization of work with respect to new technology. It is precisely the combination of these systems which A. Yu. Kaminskas believes makes it possible to attain a further increase in the efficiency of the work of the institute in the future.

#### The Results of the Experiment Could Be Better

Not everything in the experiment went smoothly. And now it is important to see those negative features which manifested themselves in the course of the conduct of the experiment.

Not all institutes which armed themselves with the new system of wages for scientists went the distance: Five of them "strayed from the path". These are the All-Union Scientific Research and Planning Design Institute of Metallurgical Machine Building, the All-Union Scientific Research Institute of Mechanization and Electrification of Agriculture, the Scientific Research Institute of Physiology and Biochemistry of Plants of the MSSR Academy of Sciences, the Kagul Experiment Station of the MSSR Ministry of Agriculture, and the All-Union Scientific Research Institute of Construction Polymers. In every institute which discontinued the experiment there were objective reasons for this. However, the positive experience of 67 scientific institutions which today, too, are successfully operating "a la Karpov", as well as the negative experience of the five mentioned above, convincingly demonstrate: The unbiased public assessment of the efficiency of the work of every staff member is not simply a labor-consuming and responsible matter, but in addition requires of the collective a certain level of civil maturity.

For any director of a scientific department or laboratory, apparently, it is not particularly difficult to assess the quality of the work of every one of the people directly subordinated to him. But not every director has sufficient courage or desire to tell the scientist about it aloud. The "Karpov" system can be successfully applied only where a favorable moral climate has been created and a sufficiently high level of exactingness toward personnel has developed.

In those few institutes, in which the attestation was conducted in a mere formal manner, and in which they tried to set the wage for every staff member without going beyond its traditional limits, taking into account the length of service and the presence of an academic degree, outside a connection with the real work merits of the staff member, the experiment gradually came down to nothing.

There were also other defects in the conduct of the experiment. Not all ministries and departments systematically monitored the course of the experiment. The effectiveness of the application of the new principles of the payment of scientific work could still be higher if the assessment of the activity of the individual staff members would be fully supplemented by an assessment of the work of its structural subdivisions and a total assessment of the activity of the entire institute, which the ministries and departments of the USSR and the union republics must periodically carry out in conformity with the decision of the directive organs. But in practice this is by far not always done. In a number of cases, the ministries and departments, without sufficient reasons, corrected the plan targets for the institutes, including those for the wage fund, which somewhat reduced the purity of the experiment.

#### The Next Step is Needed

In spite of some negative touches in the conduct of the experiment, on the whole the results of the 15-year application of the experimental system of the payment of the work of the personnel of scientific research institutes must, in our view, be assessed as highly positive. The main result, as was said above, consists in the increase in the efficiency and quality of the work of the scientific collectives, the reduction of the periods of research, the acceleration of the introduction of its results in practice, and the growth of the creative activity of the scientific personnel. In the course of the experiment it was demonstrated that, in such a specific sphere as science, it is possible in practice to link a basic part of the wage of the scientist--his salary--to the results of his work.

In assessing the results of the application of the "Karpov" system of the payment for work in subordinate scientific research institutions, the ministries also note many other positive aspects of its influence on the work of the scientific research institutions. I shall name some of them. There was an improvement in the organizational structure; the personnel of the scientific institutions were stabilized. The interest in the unnecessary exaggeration of the number of personnel disappeared. A stop was put to the artificial creation of a large number of executive positions in the structural subdivisions of the institutes for the purpose of increasing the wage of some staff members. The possibility appeared of attracting, on a broad basis, gifted and highly-skilled specialists without an academic degree, into scientific institutions from the sphere of production. The comprehensive assessment of the results of the activity of every staff member was conducive to the increase in the exactingness of scientific personnel vis-a-vis themselves and strengthened the feeling of responsibility for the quality of the work being carried out.

I would like to supplement these generalized assessments of the ministries and departments with the statements of the directors of some of the institutes which for many years have been operating in accordance with the "Karpov" system.

V. A. Makarov, the deputy director of the Physical Chemistry Scientific Research Institute imeni L. Ya. Karpov, candidate of chemistry:

--We cannot conceive of the work of the Institute without the "Karpov" system. Today the collective could not cope with the tasks set before it if the right did not exist to apply the conditions for the payment of work operating in our institute.

K. I. Ushakov, the director of the State Scientific Research Institute of Non-ferrous Metals:

--The economic efficiency of the work of the Institute during the period of the experiment increased threefold. The volume of work carried out doubled with an unchanged number of staff members. The level of the potentiality of the work increased from 33 percent to 64 percent. The secret lies in the fact that the "Karpov" system made it possible to create a genuinely creative atmosphere in the scientific collective. Thanks to the wide "bracket" of salaries, the pursuit of higher administrative posts disappeared, and the aspiration passed to obtain an academic degree at any cost as soon as possible. Dissertations are now being defended organically, in accordance with the accumulation of the material, and the main creative efforts of the research scientists are directed at the achievement of the attainment of a substantial scientific result.

V. A. Pelipeyko, deputy director of the Institute of Electronics and Computer Technology of the LaSSR Academy of Sciences, candidate of economics:

The Institute plays a leading role in the country and occupies advanced positions in the international programs of the CEMA in one of the most urgent spheres of scientific-technical progress--the creation of a computer network. The high efficiency and purposefulness of the research has been determined by an effective system of the payment of labor, a system which conducive to the creation, in the Institute, of a climate of high exactingness and responsibility for the results of the scientific work of each individual staff member, as well as the entire collective. The stabilization of the personnel has been conducive to the increase of their qualifications, the accumulation of the scientific potential of the institute, and the deepening of the basic nature of the research being conducted.

It is important to underscore that the establishment of salaries for the personnel of scientific institutions in accordance with the results of their work in the conditions of the "Karpov" experiment provided for a significant increase in the average pay of the staff members. I will recall: In 10 years it grew here approximately by 40 percent. Taking into account the fact that the growth of wages took place in the institutes at the expense of internal resources, without the allotment of additional funds from the budget, the dissemination of the "Karpov" system makes it possible to increase wages for the efficiently working scientists long before the execution of centralized state-wide measures in regard to the increase of the wages of personnel of the non-production spheres of the national economy.

Many ministries and departments of the USSR and the union republics, after having presented reports on the results of the application of the new system of wages in subordinate institutes, are proposing to disseminate it to a broad range of organizations. Some union ministries consider it expedient to transfer all scientific research organizations of their sector to the "Karpov" system. We believe that these proposals deserve attentive study and support.

The system of wages for the personnel of scientific research institutes in accordance with the results of their work, which was born in the Institute imeni L. Ya. Karpov, has demonstrated its viability as a stimulus for highly efficient research work. In our view, the time has come to transfer the "Karpov" system from the category of experimental systems into the category of verified systems that are actively being applied. To this end, the ministries and departments of the USSR and the union republics should be granted the right to transfer subordinate scientific research institutions (in proportion to their readiness) to the indicated system of wages.

At the June (1983) Plenum of the CPSU Central Committee, comrade Yu. V. Andropov talked about necessity of the development of a system of organizational, economic and moral measures, which would interest both directors and workers, as well as, of course, scientists and designers, in the renewal of technology. The recently adopted decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures for the Acceleration of Scientific-Technical Progress in the National Economy" is aimed at the solution of this problem.

The broad application of the wage system for the personnel of scientific research institutions in accordance with the result of their work must become one of the links in the system of measures which in its sum will secure a basic improvement of all work with respect to the acceleration of scientific-technical progress.

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## LABOR

### LABOR OFFICIAL COMMENTS ON SPECIAL WAGE FEATURES OF THE 1980'S

Moscow SOTSIALISTICHESKIY TRUD in Russian No 2, Feb 84 pp 105-111

[Article by Yu. Kokin, deputy director of Scientific-Research Institute of Labor: "On Special Features of Wage Organization in the '80s"]

[Text] Improvement of distribution relationships was spelled out at the June (1983) Plenum of the CPSU Central Committee in a number of topical problems to which the attention of practical workers and Soviet economic science is drawn. "We cannot forget..." Comrade Yu.V. Andropov said at the Plenum, "...that we live in a socialist society whose development should be regulated by the fundamental principles of socialism, including, of course, the principle of distribution according to labor. It is clear from this how important discussion and resolution are of certain essential factors in the field of wage organization in the '80s and, in particular, a clear cut determination of the functional designation of basic structural elements of wages of workers and their utilization in accordance with their direct function.

In the course of discussion of Ye. Kapustin's article, the need was justifiably stressed to increase the dependence of each worker's wages on his personal labor contribution and on the end results of work of the collective and to boost the motivating role of pay in raising labor productivity, improving quality of production and economical expenditure of all types of resources. Guided by fair positions to the effect that society can distribute only that which is produced and that personal and social needs are satisfied more fully when the results of labor are bigger; it is necessary as a central task of the country's economic development in the next decade to boost efficiency of production and only on this basis--growth of the people's well-being. Retaining the continuity of the course of the country's social-economic development and acting in accordance with the strategic aims of the party outlined for the '80s for improving the well-being of the people, it is necessary to aim current measures in the sphere of wages at ensuring a high rate of scientific and technical progress. The wages themselves should, in our view, retain their determining role in general growth of workers' income with increasing dependence of levels and differentiation in remuneration of labor on the complexity, conditions and results of labor.

We fully share Ye. Kapustin's point of view in regard to the fact that the "general direction of development of distribution relationships in the immediate

future will be increased differentiation in remuneration of labor." This is linked to the need to maintain optimal relations in levels of pay depending on complexity, conditions and intensiveness of labor, on the one hand, and to increase the material interest of workers and employess in growth of labor and production efficiency, on the other. The raising of the average pay of workers and employes in the national economy and for individual sectors must occur while taking into consideration growth of labor productivity and of production efficiency. It would seem to be necessary and advisable to "relate" the basic portion of wage growth to output and improved quality of production (work) for the purpose of ensuring that labor-productivity growth stays ahead of wage growth.

As a result of the stable growth of the minimum and average wage, a new and significant step will have been made toward the end of the 11th Five-Year Plan in the solution of a major social problem--a significant reduction in the number of low wage earners. The basis for further movement in this can and must be accelerated curtailment of the sphere of spread of plain manual labor in connection with scientific-technical progress through its mechanization and improved labor organization, which will provide conditions for the performance of more complex, skilled and consequently higher paid work by these workers.

In the field of wage organization, the necessity is becoming increasingly clear to implement in a new way centralized measures in the wage sphere. This applies both to the aims and to the methods of introducing new wage rate conditions on the basis of a higher minimum. The transition to higher wage rates of workers and new salaries of managers, engineering-technical personnel and employes should be subordinated first and foremost to improved wage organization rather than to its absolute levels and nominal income of workers. With the attained wage level (by 1985 about 193 rubles per month) it would be practicable, in our opinion, to refrain from raising everybody's earnings; this should be done only with growth of the personal labor contribution of each person as a result of the work of the collective of an enterprise (association) and to carry out centralized measures for raising the wage minimum and at the same time periodically the rates and salaries of all categories: once in 5-10 years. At the same time, it is important that this be accompanied by a complex of organizational and technical and planning and economic measures, including the introduction of new equipment and technology, mechanization of heavy manual labor and improvement of its conditions and also norm setting of labor and complete replacement of obsolete norms with technically based and other measures making it possible to perform the prescribed volume of work with the smallest number of personnel, introduction of scientific labor organization for workers and employes (to improve the organization of workplaces and their servicing, to broadly disseminate model plans of workplaces, improvement of and introduction of progressive labor methods and techniques, adoption of collective (brigade) forms of labor organization and pay, first of all the brigade contract, and development of principles of cost accounting at the bottom levels of production management. Measures are also needed for improving the structure of management, the intraplant system of day-to-day production planning, mechanization and automation of planning and accounting work and processes of management, specialization of production subdivisions and centralization of the functions of management and services.

It is important to basically change the manner of raising rates and salaries. This should be done in accordance with the decisions of the 26th CPSU Congress primarily with enterprises' and sectors' own funds on the basis of fuller utilization of technical achievements, reduction in the number of personnel and improved organization of production and labor. Centralized resources, the size of which must not be dominant should be allocated only for raising the guaranteed minimum and improving correlations in remuneration of labor.

In the course of a discussion on the pages of the journal SOTSIALISTICHESKIY TRUD and in a number of other publications, the opinion has been stated more than once that the grade category (position) reflects only the potentialities of a worker, but it is necessary to set wages while taking account the realization of these potentialities in the concrete results of labor activity. Yet in speaking of the fact that the category and position of an employe reflect only his potential abilities, one should not fall into error, since from the point of view of social evaluation of labor, conferment on a person of a certain skill category or confirmation of appointment to a position signifies a certain evaluation of his contribution to public production. When a worker does not provide this contribution be it because the reasons for this do not depend on him or because of his personal qualities and attitude toward work, a certain digression from the rules occurs.

Consequently, the rate was and cannot but help continue to be the basis of regulation of correlations in pay depending on the complexity of labor (skill level), its conditions and intensiveness. Ensuring a connection between the earnings of each worker and the results of individual labor and the total work results of the collective should be attained with the help of intracategory differentiation of the rate and specifically through the use of additional payment for occupational mastery, high skill levels for specialists, holding down of two jobs, salary differentiation within the limits of "parameters" of skill categorizing of specialists, establishment of classes for master workers and certain other engineering and technical personnel. A significant role in boosting the motivating role of wages is bound to be played by a rational system of bonuses and improvement of the forms and methods of paying bonuses according to the collective's work results for the year.

Strengthening of centralized wage management and increasing the stimulating effect of its organization should be provided by the establishment of funds for wages on the basis of long acting norms in combination with expansion of the rights of sectors and enterprises (organizations) in the area of utilization of funds planned for them. Savings of the wage fund obtained on the basis of improved indicators of operational activity and primarily higher

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I. Shkurko, S.I., "On Increasing the Stimulating Role of Rates and Amounts in Wages."--PLANOVAYE KHOZYAYSTVO, No 8, 1983; "materialy Vsesoyuznoy nauchnoy konferentsii 'Problemy sovershenstvovaniya r-spredelitel'nykh otnosheniy na sovremennom etape'"[Materials of the All-Union Scientific Conference "Problems of Improving Distribution Relationships at the Present stage"] organized in December 1982 by the Institute of Economics of the USSR Academy of Sciences, the USSR Ministry of Higher and Secondary Specialized Education and the Central NTO Board.

labor productivity or because of fulfillment of planned volume of production with a small number of personnel should be left at the disposal of collectives for rewarding higher work results. Naturally, it is necessary to provide in this connection economically valid proportions between growth of labor productivity and growth of wages.

The mechanism of normative planning of the wage fund presently being used in industry possesses a significant defect of a methodological character. It does not allow preservation stability of norms in the case of a significant deviation of the targets of the annual plan from the targets of the five-year plan for the given year. Inasmuch as wage-fund changes are provided in the annual plan in direct proportion to a change in the volume of production, this results either in inflation or in reduction of the size of the planned fund relative to that which is required, since among 70-80 percent of workers of an enterprise (auxiliary workers, engineering-technical personnel, employes, junior service personnel, security guards) pay in the case of a change in the volume of production changes insignificantly. In our opinion, it would be possible to eliminate this defect if two rather than one normative amount are established for enterprises.

Variant 1--to determine for an enterprise in the five-year plan: for personnel not directly connected with the change in production volume a portion of the wage fund in absolute size and for basic production workers directly manufacturing products to establish norms of planned wage outlays being reduced according to the years of the five-year plan (while taking into account what measures will be implemented for ensuring planned growth of labor productivity).

Variant 2--to determine for an enterprise the base (normative) wage fund in absolute size for all personnel of the enterprise and growth norms of this fund for each ruble of production-volume growth which will guarantee growth of wages for workers responsible for this growth.

The Scientific-Research Institute of Labor has prepared methodological recommendations for normative planning of the wage fund based on the said principles.

As for questions of regulation of wage differentiation according to complexity of labor and intersectorial unity in remuneration of labor of the same complexity, they in our view can be resolved by going over to a single wage scale for remuneration of the labor of workers and maximal reduction of the number of initial wage rates of category I (for normal working conditions). Such wage scales presuppose the establishment of single rate coefficients and categories for work of equal difficulty in all types of production operations of industry, construction and other sectors. A prerequisite for setting up a unified wage rates should be analytical work for the disclosure and measurement of differences in work difficulty.

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2. "Normativnoye planirovaniye fonda zarabotnoy platy. Metodicheskiye rekomendatsii" [Normative Planning of Wage Fund. Methodological Recommendations]. Moscow, NII truda [Scientific-Research Institute of Labor], 1979.

Intersectorial comparisons of work according to its difficulty by means of a method of evaluating the skill level of workers as an indicator of difficulty of performed work conducted by the Scientific-Research Institute of Labor on the example of nine of the most important sectors of industry showed the presence at the present time of significant differences in levels of work difficulty rated as the highest (6th) category depending on the sector. According to our data, category 6 in light industry can be equated only with category 4 in machine building; category 6 in printing, pulp-paper and the textile industry corresponds to category 5 in machine building. Consequently, it would be more sound for such a procedure of grouping according to wage scales where the highest rate category for one group of sectors would be 6, for another--5 and for a third--4.

Of course, the introduction of such a procedure based on a 6-category scale would have resulted in a narrowing of the scope of occupational grouping and created difficulties in materially stimulating the skill growth of workers in sectors where the number of categories. But with an 8-category scale, different sectors can occupy in it an appropriate "block" of categories. In such a case, work and basic-production work and occupations in ferrous metallurgy and electric-power engineering could find their place in the said scale since these now utilize categories 8 and 7. This would also permit raising the grouping of rates for a number of jobs and occupations in machine building and other sectors whose level of difficulty according to presently existing scales exceeds the maximum 6th category. Such a change would mean a most significant unification of the system of rates for sectors, moreover a unification requiring at the same time large funds and therefore can only be proposed for the future.

In his description of other principal elements and functions of the rate system, Ye. Kapustin brings out very fairly questions of working conditions. In this connection, we would like to share our ideas. Although in our opinion the correlation of compensatory and motivating functions of higher pay for deviation of conditions of labor from normal objectively changes and will change in the future in favor of the latter. On the whole, demands on the production setting, the content of labor and other comparable characteristics of it are growing constantly. For this reason, it would be legitimate to assume further growth of differentiation in pay according to the working-conditions factor in the broad sense of the word. The existing differentiation of rates according to five groups (normal, difficult and harmful, especially difficult and especially harmful, open mining and underground operations) based on relative differences in wage rates for work with normal and unfavorable conditions can be retained. But at the same time, it would seem to be preferable to introduce for all categories equal increases in absolute sizes for adverse working conditions.

In passing from the principle of a relative increase of rates based on working conditions to an absolute increase, a comparatively greater growth of the rate portion of pay among workers belonging to initial categories can be provided. In this way a real possibility will appear to reject reduced output norms, unjustified pay systems, raising of bonus sizes and raising of categories and other "methods" with whose aid enterprises are obliged to "pull up"

the wage level of workers in those sectors where the consequences of a cadre shortage are most acutely felt. In addition, the use of absolute increases for working conditions as an independent element of the rate system opens up big possibilities for the use of a single rate scale reflecting first and foremost differences in difficulty of performed work. Then all payments relating to other factors of wage differentiation will be credited to the rate.

With an increase in absolute sizes, a worker employed in sectors with adverse working condition will clearly understand what portion he will receive for deviation of working conditions from the normal. The enterprise will also be able to clearly see what portion of its wage fund "goes" as compensation of adverse working condition and for attracting workers to them. With such conditions, it is possible to realize the proposal repeatedly advanced at different levels: in order to motivate heads of enterprises to constantly implement measures for the purpose of improving working conditions, to establish in the planned wage fund a portion of the money allotted for payments in connection with deviation of working conditions from normal ones, to control the expenditure of this portion of the fund, penalizing the guilty parties for its overexpenditure and to stimulate the fulfillment of planned correlations. In this direction of boosting the active role of wage organization for better grounded compensation of adverse working conditions, there could be utilized in the future an analytical appraisal of working conditions on the basis of factors directly at the workplace instead of a listing of jobs and occupations for which higher pay has been established.

We would especially like to point out the novelty of Ye. Kapustin's formulation of questions relating to norm setting of labor. But not everything should be accepted here without qualification. In particular, the manner of revision and establishment of new norms that he proposes stems in our opinion from a certain underestimation of the work that was done in recent years in the field of dissemination of intersectorial and sectorial norms not only for piecework but also for work paid according to a time rate. This contributes to providing approximately the same level of strenuousness of labor at similar jobs performed under identical organizational and technical conditions. It is legitimate to raise the question of differentiation of wage rates not on the basis of the principle of form of pay but on the basis of level of norm setting of labor, since it determines in the first place the degree of strenuousness and in particular its correspondence to the socially necessary level of intensiveness. The problem has been put on the agenda of developing a mechanism for evaluating the degree of strenuousness of norms that would make it possible to objectively rank jobs according to the level of strenuousness, ensuring thereby equal conditions of pay for equally strenuous labor. Over the long term, it would be possible to adopt on this basis two groups of wage rates: the first for jobs rated according to technically based norms, including in accordance with sectorial and intersectorial norms of labor expenditures, and the second--rated according to experimental-statistical norms or not rated at all.

For jobs of the first group, taking into consideration the degree of strenuousness of norms, it is practicable to use wage rates increased by 20-30 percent. The rates raised according to progressiveness of norms constitute a promising form of encouraging their introduction.

Following the implementation of centralized measures for introducing new rate conditions, the main attention should be aimed at maintaining progressiveness of norms through the timely renewal of standards and existing norms while taking into account new equipment, technology and scientific labor organization. For the purpose of creating in this connection economic prerequisites for carrying out of this work, it will be possible for enterprises to retain the right in the case of introduction of norms computed on the basis of progressive intersectorial and sectorial standards to utilize wage rates that are up to 20 percent, and in a number of sectors up to 30 percent, higher. In the future, it would appear to be useful to periodically reexamine norms in accordance with plans for reducing labor intensiveness and growth of labor productivity. As a rule, each year there should be carried out an evaluation of intensity of existing norms on the basis of certification of each workplace and determination of the correspondence of norms of planned labor intensive ness of output to technically based standards of labor outlays.

The transition, where it is practicable, from operational norms to integrated [ukrupnennyye] norms, that is, those established for the end product (item, brigade batch [brigado-komplekt], structure, volume of agricultural production and so on). For the purpose of increasing stimuli for reduction of labor intensiveness of output, it would be possible, in our opinion, to grant the right to enterprises on introduction of technical, organizational and other measures to retain during the period between revisions of norms existing rates unchanged, which would motivate the introduction of advanced labor methods and accelerated utilization of new equipment.

Wage forms should also be subordinated to the task of boosting the labor activity of all workers employed in the national economy. It would appear that the time has arrived to reexamine the point of view created in the past of getting rid of such forms of labor remuneration as direct piece-rate, pay by the job, indirect piece-rate and to utilize them in paying workers in those sectors of production where they would contribute to saving time, manpower resources and material outlays.

Under the influence of increased requirements for quality of production and results of labor with an increase in the relative share of workers engaged in the repair and adjustment of equipment and an increase in the number of enterprises and sectors where a high professional level of all-round workers [rabochii-universaly] is becoming the norm, there is reason to believe that the tendency is continuing of reducing the relative share of workers paid piece-rate. But the process of gradual elimination of the piece-rate form should not be considered as absolute as in industry, and particularly in construction, and in agriculture the principle of piece-rate pay retain their importance, first of all there where it is particularly important to motivate the attainment of certain quantitative indicators and their growth.

Bonuses should help increase flexibility of pay and maximize its connection to individual and collective results. Measures adopted in recent years on improving the bonus mechanism contributed to a significant degree to solving the problems of boosting production efficiency in the 10th and first years of the current five-year plan. At the same time, both in organizing awarding

of bonuses, in the mechanism of distribution of bonuses among workers and in economic validation of sizes of bonus funds, many problems exist whose solution is imminent.

Today it is already possible and necessary to work for a closer connection of bonus payments to specific indicators on which workers exert a direct influence. First of all, this problem exists in regard to motivating the work of engineering and technical personnel, bonuses to whom are frequently geared to indicators of the operation of an enterprise as a whole and do not sufficiently take into consideration the concrete achievements of the workers. For increasing the stimulating influence of bonus system, especially when applied to the category of managerial personnel, it is necessary to ensure consistent observance of the regulation on securing, aside from those common to all, specifically to each of those bonus-award indicators which have a direct bearing on the sphere of his activity.

In the organization of bonus awards, it seems necessary to overcome still another defect of the system of paying bonuses existing at the present time and expressed in nonawards of bonuses to those who have not fulfilled one of the numerous conditions and additional indicators. It evidently makes sense to go over to computing bonuses for individual indicators with the bonus fund being divided into appropriate parts.

In studying the special features of wage organization and differentiation in the '80s, one cannot but help point out such of its important aspects as disparity in relationships of the pay levels of basic categories of personnel (first of all workers and engineering-technical personnel) as well as a certain groundlessness of intersectorial correlations in wage levels for similar jobs and for workers with identical qualifications.

Leveling according to labor of the income of different social groups of workers, being a consequence of changes in labor content, constitutes one of the patterns of development of a socialist economy and our way of life. But if we consider the dynamics of remuneration of labor within these groups from positions of wages fulfilling a stimulating role, then by no means every leveling of income will be justified. For the purpose of ensuring the necessary correlations in the pay levels of workers, engineering-technical personnel and employes, it would appear to be legitimate when implementing measures in the field of wages to provide for more active growth rates of salaries of engineering and technical personnel in comparison to raising the wage-rate levels of workers. Measures aimed at increasing the flexibility of the pay system of managers and engineering and technical personnel and strengthening its connection to work results will also serve this purpose. Interesting in this connection is the experience on improving the earnings of designers and technologists of a number of production associations in Leningrad as well as an experiment at a number of enterprises of machine-building ministries located in other cities of the country which began in 1983 and will continue in 1984-1985.

Another economic experiment being conducted at enterprises of the UkSSR Ministry of Heavy and Transport Machine Building, Ministry of Electrical Equipment

Industry, Ministry of Food Industry, the BSSR Ministry of Light Industry and the Lithuanian Ministry of Local Industry provides for increasing the interest of labor collectives in growth of production efficiency and strengthening of cost accounting through improvement of the practice of forming funds of payment according to labor, the use of a broader system of extra payments and increases through economy of the wage fund and improvement of the practice of awarding bonuses for the basic results of operational activity and end results of production.

Problems of the national-economic importance of sectors as a wage differentiation factor in the course of the discussion came to occupy in the course of the discussion a significant place on the pages of the journal. The point of view appears to be more right of those who consider it necessary not to consider the significance of spheres of application of labor as a leading factor in determining correlations in wage levels inasmuch as historical and social-economic conditions of the country's development have changed significantly.

At one time, active material stimulation of workers employed in the leading sectors was necessary for the purpose of creating in our country a powerful technical base for socialist industry. This was primarily reflected in more significant raising of wages in sectors of heavy industry compared to light and food and in industry as a whole compared to agriculture and sectors of the nonproduction sphere. At the present time, when a course has been declared for raising the material and cultural level of the people's life as the chief task of economic policy, all-out development is required both of heavy industry and of sectors providing for the needs of the population in diverse consumer goods. This cannot but help have an impact on changes in intersectorial relationships in wage levels and its growth rates for sectors of the national economy and sectors of industry. Undoubtedly, advantages in wage sizes must be ensured for workers of sectors on which technical progress primarily depends and which in some measure determine the forward movement of the economy, but at the same time providing for the effective demand of the population for consumer goods is of great importance at the present stage, which also means pay level of workers of the corresponding sectors. In addition, there is a need for a balanced increase of the wage rates of workers in nonproduction sectors. Analysis of the growth rate of average pay during 1960-1980 shows a preferential increase of its size in production sectors compared to nonproduction ones. In all production sectors aside from industry, the wage growth rate exceeded the average indicator for the national economy. Wages in agriculture and construction grew fastest; wages in such sectors as public education, health care, science and scientific services increased significantly below the average rate. As a result, the social and cultural sectors--health care and public education--continue to lag somewhat in level of pay at the present time.

For the long term, diminution of intersectorial differences in difficulty of labor and skills of workers and improved working conditions, first of all in sectors and types of production operation, which are characterized by their deviation from the norm, as well as a significant growth in wage levels in all sectors of the national economy without definitively removing the problem of consideration in wages of the national-economic significance of sectors

require searching for new approaches for its solution. It would appear practicable to direct one's efforts for further curtailment of relative differences in wage levels for sectors of industry and the national economy but at the same time to maintain the required absolute differences in pay levels.

Finally, another essential question of wage policy in the immediate future. It is important in our view to overcome the opinion current in the minds of many scientific workers and economic managers to the effect that present difficulties and unsolved problems in the sphere of raising production efficiency can be primarily resolved on the basis of improvement of the mechanism of pay and material incentives. Undoubtedly, the ensuring of a close tie between measure of labor and measure of pay is of importance to the solution of this problem, while improvement of forms and methods of distribution, improvement of wage organization in the direction of achieving greater correspondence between its amount and quality of expended labor and its results provide their positive effect. But practice shows that with growth of the absolute size it ceases to be the only or even the main incentive in selection of the sphere of application of labor and high level of its results. Consequently, problems of improvement of wage organization should be considered in close relation to improved conditions of labor and its content and to improvement of the technical base of production and the solution on this basis of problems in the field of satisfaction of the entire gamut of social and consumer requirements of workers. Only in a complex of creative, moral and social stimuli will material stimuli play their positive role and create conditions for the solution of tasks set forth before the Soviet people by the Communist Party.

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## LABOR

### ECONOMISTS DISCUSS RURAL LABOR POTENTIAL

Moscow SOTSIALISTICHESKIY TRUD in Russian No 2, Feb 84 pp 27-30

[Article by V. Mashenkov, doctor of economic sciences, and V. Shlyakhtin, candidate of economic sciences (VNIESKh [All-Union Scientific-Research Institute of Agricultural Economics]): "Rural Labor Potential"]

[Text] The Food Program that was approved by the May (1982) Plenum of the CPSU Central Committee, as well as the decrees that were adopted by the directive agencies in connection with that program, determine for the current decade the paths of development of socialist agriculture and the entire agroindustrial complex (APK). A necessary condition for the successful implementation of the planned tasks is the efficient use of the rural labor potential.

When studying the essence of the rural labor potential, the quantitative and qualitative changes occurring in it, and determining its extent and developing recommendations for increasing the effectiveness of its use, it is necessary to take into consideration the structural shifts in the development and improvement of the productive forces of the branch, as well as the high degree of maturity of the socialist production relations that dominate in it.

With the development of the productive forces there occurred substantial changes in the structure of the aggregate worker in agriculture, and the further deepening of the social division of labor considerably expanded the professional makeup of the agricultural workers both at individual enterprises and in the branch and the entire agroindustrial complex. During the past two decades, in the makeup of the national-economic agroindustrial complex for the purpose of serving agriculture, there have been created a large number of large-scale specialized branches and enterprises, including construction, the combined-fodder and microbiological industry, organizations of Sel'khoztekhnika and Sel'khozhimiya, plants for the calibrating of hybrid corn seeds, poultry factories, and plants for the primary processing of flax. The cleaning, drying, and storage of grain in elevators received broad development. Therefore, when studying the present professional composition of the labor potential in agriculture, it would be incorrect to limit oneself only to the personnel on kolkhozes and sovkhozes.

The changes that have occurred in the division of labor in agriculture should also be kept in mind when analyzing labor productivity, since without a consideration of the expenditures in the branches that service the rural areas

the labor productivity is incomparable in its dynamics. It is necessary to study in a purposeful manner the questions that pertain to the degree to which the level of proficiency of the workers in agricultural production corresponds to the degree of technical equipment in that production and to the changes that are occurring in its technological processes as a result of the complication of the operations. It is necessary to have methodological instructions for determining the influence exerted upon the effectiveness of production by the extent to which the farms are manned with cadres of qualified workers and specialists, the number of whom is growing at rapid rates.

A natural base for labor resources, and, consequently, the labor potential, is the reproduction of the population. The higher the overall size of the population, the greater, all other conditions being equal, the labor potential is. In our country one has noted the tendency toward the reduction in the rural population not only in the relative, but also in the absolute sense; this is the consequence and reflection of the increase in the productivity of agricultural labor and, as a whole, can be viewed as a desirable phenomenon. Therefore one of the peculiarities of rural labor potential is the fact that it is formed under conditions of the constant reduction in the size of the rural population (from 1971 through 1981 for the country as a whole it dropped by 7 percent). To a greater degree this affected a number of oblasts in the Russian Federation, the Ukraine, Belorussia, Lithuania, etc. Simultaneously, in the republics of Central Asia, Azerbaijan, and certain other regions the size of the population increased. Thus, in the country one observed substantial differences in the nature and rates of change in the natural base of the labor potential by individual republics and regions. That dictates the need to take a differentiated approach to the resolution of the tasks of its formation and use in various rayons.

The extent of the labor potential is directly dependent also upon the age structure of the population. At the present time that structure is more favorable in the RSFSR, Georgia, Moldavia, and Armenia, where there is a high percentage of persons of able-bodied age. In the long run, however, it will be better in the republics with a high increase in the rural population, where currently there is a considerable percentage of persons who are younger than able-bodied working age. However, despite the reduction of the rural population in the country between the most recent population censuses (1970-1979) by 6.5 percent, the size of that population in working age during the same time increased by 3.4 percent, and the share of able-bodied persons in the makeup of the entire population increased by 4.7 percent. That increased the capacity of the rural labor potential, although the overall number of persons employed in all branches of agriculture dropped from 28.3 million persons in 1965 to 25.9 million persons in 1981. The greatest increase in the rural population in the able-bodied age group during recent time occurred in Tajikistan, Turkmenia, Azerbaijan, and Uzbekistan. In the Russian Federation, Belorussian, the Ukraine, Latvia, Lithuania, and Estonia it decreased.

The size of the labor potential is also influenced by the labor activity rate of the population. An analysis of the labor activity rate of the kolkhoz members indicates that, for the country as an average in 1981, women worked 226 man-days, and men worked 259 man-days, or 15 percent more. The labor

activity rate of men on kolkhozes in Tajik SSR, Turkmen SSR, and Kazakh SSR is almost one-third higher than that of women, but in Belorussia, Latvia, and Estonia, by only 3-6 percent. It evolves from this that the extent of the labor potential, all other conditions being equal, is higher in those republics, oblasts, and on those farms where there are more men in the makeup of the able-bodied population. That situation is natural, inasmuch as women have to combine work with the functions of motherhood and the running of the household. But for the country as a whole during the period between the two most recent censuses (1970-1979) the share of men in the makeup of the able-bodied rural population increased by 2.3 percent, and that created the conditions for the more complete and more effective use of the labor potential.

The rural labor potential, in its qualitative sense, is constantly growing as a result of the rise in the level of education among the population. From 1970 through 1979 for the country as a whole, for every 1000 persons employed in agriculture the number of persons with higher and secondary (complete and incomplete) education increased from 499 to 693 persons, or by 38.9 percent. According to statistical data, at the present time, among the agricultural workers in the 16-19 year age group there are no longer any persons with only primary education, and in the 30-49 year age group the number of them is less than 10 percent.

However, despite the relative increase in the size of the rural labor potential, under the influence of the factors that were considered above, one has observed in agriculture during recent years an increased shortage of manpower. This is a consequence of the fact that agriculture has been assigned the tasks of achieving a considerable increase in the production of output from vegetable and animal husbandry, and of carrying out a slight retardation of the rates of reduction of the labor-intensity of agricultural production. That resulted in an increase in the annual employment rate of the workers and an increase in the scope of attracting manpower from the outside. Thus, from 1965 through 1982 the number of man-days worked by a single average-annual worker on kolkhozes increased, for the country as a whole, from 230 to 262, and the number of persons who were taken in from other enterprises and organizations to engage in agricultural operations on kolkhozes and sovkhozes increased by a factor of 3.2.

The gap between the need for manpower and its availability in agriculture has been closed in recent years primarily by means of reinforcing its material-technical base, the carrying out of measures to reclaim the land and increase the use of chemicals in agriculture, and the increasing of the effectiveness of seed selection and seed management. From 1965 through 1981 alone the number of tractors in the country's agriculture increased by 1.6 times; grain-harvesting combines, 1.4 times; and trucks, more than 1.7 times. That made it possible to raise the level of mechanization of agricultural labor. During the same period of time the areas under cultivation on irrigated and drained land increased by more than 1.7 times. There was more than a three-fold increase in the shipments of mineral fertilizers. All this made it possible to increase labor productivity in the branch by almost 1.7 times. If the labor productivity in the 10th Five-Year Plan had been at the level of the 7th Five-Year Plan, the production of the volume of agricultural production that was actually obtained in 1976-1980 would have

required almost 19 million more workers, in average annual terms, than were actually employed.

The labor productivity of the collectives, and, consequently, the extent of the labor potential are directly influenced by the level of proficiency of the personnel. According to data provided by RSFSR TsSU [Central Statistics Administration] the annual output per tractor for Class II tractor and machine operators is 15 percent higher, and for Class I tractor and machine operators is 24 percent higher than for Class III mechanizers. At the same time the individual output per tractor for tractor and machine operators having work longevity of more than 10 years is 24.7 percent higher; longevity of 5-10 years, 15.1 percent higher; and longevity of 3-5 years, 7.5 percent higher than for tractor and machine operators with work longevity of less than 3 years. The absolute number and percentage of Class I and Class II mechanizers on the kolkhozes and sovkhozes are constantly growing. For example, during the period from 1976 through 1982 the share of Class I and Class II tractor and machine operators on the country's sovkhozes increased by 6.1 percent, and on kolkhozes, by 6.9 percent.

At the present time class certifications of skill in agriculture are awarded to workers in many occupations. According to data provided by the occupational censuses, in 1979 on the country's sovkhozes the share of Class I and Class II milkmaids was 34.1 percent, as compared with 29.4 percent in 1975; calf attendants, respectively, 24.1 and 17.8 percent; livestock attendants, 10.4 and 10.1 percent; hog attendants, 16.2 and 15.9 percent; and herdsmen, 10.7 and 8.8 percent. Thus, one observes a considerable rise in the proficiency level of the persons in animal husbandry. However, on the kolkhozes the number of workers having class certification is less than on sovkhozes. And since the labor of the Class I and Class II experts in animal husbandry is potentially more productive than the labor performed by workers who do not have that certification, it is necessary to devote more attention to developing a network of instructional comunes where the workers in the broad agricultural occupations could raise their level of proficiency and learn a second and a related occupation. In our opinion, USSR Ministry of Agriculture and USSR Gosprofobr [State Committee for Vocational and Technical Education] should also take steps to expand the training of the workers employed in the broad agricultural occupations by training women.

However, the progressive changes occurring in agricultural production and beneficially influencing the rise in the labor potential largely depend upon the conformity of the proficiency of the personnel to the nature and level of the means of production. One still observes, unfortunately, that the extent of the labor potential, because of the lack of any special training for a considerable number of the workers in vegetable and animal husbandry, is lower than the demands being made upon it. Despite the fact that during the past decade the number of mechanizers increased by more than one million persons, and there was an increase in the number of operators at the animal-husbandry complexes and poultry farms, one still observes among them a large percentage of persons with a low level of proficiency. For example, 40-50 percent of the tractor and machine operators completed only short-duration mechanizer courses. True, for the most part, these are people in the older age groups who have a long work longevity and who have been permanently assigned to the farms. Among the younger mechanizers, conversely,

most of them have training in the volume of the rural occupational-technical school (SPTU). However, the rate of permanent assignment of them to rural areas is considerably lower. The improvement of the occupational and proficiency makeup of the rural workers can be achieved only if one can develop its infrastructure and can create all the necessary conditions for the working, everyday living, training, and recreational conditions for the young people, because during the years of the 9th Five-Year Plan alone, the SPTU trained more than 3.2 million mechanizers and workers in other rural occupations, but many of them were not permanently assigned to rural areas.

The increase in the effectiveness of the use of the labor potential is also promoted by the improvement of the organization of labor. For example, the introduction of the scientific organization of labor, and, in particular, group forms of the use of technology, increases the labor productivity of the mechanizers by approximately 20-25 percent; the use of combined assemblies in vegetable husbandry, 1.5 times; and the operation of mechanizers in two shifts, by 15-20 percent. In brigades and links that work without a work order, the labor productivity is 15-30 percent higher than the ordinary ones. When cows are allowed to roam free, the labor productivity on animal farms is 30-40 percent higher; with the flow-line shop system of milk production, 25-30 percent; and the link organization of labor, 10-15 percent. A saving of labor is also guaranteed by changing the cows to a system of double milking. At the present time there exist all the conditions (a powerful technical base, qualified personnel, increased opportunities since the May 1982 Plenum of the CPSU Central Committee for the farms to provide material incentives to the workers) for the broad introduction of the collective contract -- the most progressive form of organization of labor and of providing incentives for it.

A considerable influence upon increasing the effectiveness of use of the labor potential is exerted by the improvement of the workers' working conditions, as well as the reduction of losses of work time for organizational reasons. And those losses are still large. For example, according to data provided by RSFSR Ministry of Agriculture, on the kolkhozes and sovkhozes in the republic, simply as a result of the tardy provision with fuel, planting materials, etc., the losses of work time for the tractor operators still constitute an average of 16-19 percent. The reduction of the losses of work time is promoted by the raising of the level of management of agricultural production, and the improvement of the training of the managers and specialists in agriculture. Their level of proficiency, their organizing capabilities, their knowledge of the job at hand, their ability to foresee and find a contact with people largely determine the organization of production and labor, and, consequently, its productivity.

The use of such additional sources of manpower as persons of retirement age, disabled persons, and adolescents, requires special attention. During recent years the percentage of their participation in social production has dropped considerably. For example, whereas in 1970 the total share of kolkhoz members of retirement age who were working in social production was 34.8 percent, in 1981, it was only 24.5 percent. There was also a drop in the percentage of disabled persons and adolescents among the workers. However, that drop, to a considerable degree, was compensated for by an increase in the annual employment rate

for those categories of workers (whereas, for example, a single kolkhoz member of retirement age, for the country as a whole, worked 79 man-days in 1979, in 1980 he worked 94), and, most importantly, was compensated for by an increase in the labor activity rate of the able-bodied kolkhoz members. It must be taken into consideration that, in order to involve in social production retired and disabled persons and adolescents, the state, in addition to paying them the ordinary remuneration for their labor, also employs other material and psychological incentives (reduced output norms and a shortened work day for adolescents; the retention of pensions by the retirees; the recomputations of pensions; the rendering of assistance in the running of a personal garden plot; etc.).

In rural areas steps are still being taken slowly to overcome the seasonal drops in the use of the labor resources. In order to overcome this, it is necessary to create additional branches and production entities with different time requirements for manpower as compared with the basic production entity. In those additional branches and production entities the professional makeup of the workers will be broader than on the narrowly specialized farms, there will be more opportunities for combining occupations, and this will increase the labor potential of the collectives. But this, in its turn, will require constant work to guarantee the balancing between the number of work sites and the number of workers.

The effectiveness of the use of labor potential largely depends also upon the workers' attitude to labor, the state of discipline, and the stability of the labor collectives. Inasmuch as, under present-day conditions, as a result of the acceleration of scientific-technical progress, there is a constant increase in the extent to which labor is provided with funds, the losses of work time as a consequence of violations of labor discipline and personnel turnover lead not only to the underuse of manpower, but also to the underuse of technology and equipment. High personnel turnover leads to a reduction in labor productivity as a consequence of the losses of work time as the worker gets settled and gets adapted to the new location. In addition, expenditures of funds to retrain the new workers are also inevitable.

Every agricultural enterprise must currently have a comprehensive plan that provides for the improvement of the organization and conditions of labor, the intensification of the material and psychological incentive plan for the workers, the increase in the effectiveness of the socialist competition, the intensification of the struggle against violations of labor discipline, etc.

The formation and use of the labor potential in agriculture is a complicated and multifaceted socioeconomic problem. Various factors have a different effect upon its size, and this must be taken into the maximum consideration in the plans and forecasts for the development of the national economy. During recent years, under the guidance of the CPSU, major economic-organizational measures were carried out to increase the rate of activity of the labor collectives on the basis of the broader use in their life of socialist principles of self-government. Specific ways have also been indicated for achieving the efficient use of manpower at enterprises and in organizations at the present stage in the development of the productive forces of society. The broad application in the practical situation of the rights that have been

granted to the labor collectives under the new economic conditions that are favorable for agriculture, will guarantee, in our opinion, the more complete and more effective use of the labor potential in this very important branch and will contribute to the successful resolution of the USSR Food Program.

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LABOR

VARIATIONS IN FARM WORKER LEISURE, WORKING TIME COMPARED

Moscow EKONOMICHESKIYE NAUKI in Russian No 11, Nov 83 pp 92-94

[Article by M. Butabaev, candidate economic sciences, and A. Khatamov: "The Kolkhoz Member's Working Time and Leisure Time"]

[Text] In the developed socialist society, questions of the rational use of working and leisure time are not only the subject of scientific research; they become a component element of government policy. Determining the social and economic program of the 11th Five-Year Plan, the 26th CPSU Congress set the task of a more rational utilization of working time, a reduction in its unproductive expenditure and loss, and an increase in leisure time for workers.<sup>1</sup> The resolution of this task demands a thorough elaboration of problems of the multilateral basis of the optimal structure, factors and ways of rational utilization of working and leisure time according to the branches of material production, workers' professions and population categories. In these connections, we should note that in recent years a number of works have appeared in which various aspects of problems regarding leisure time under socialism, including agriculture, are analyzed. But questions regarding the increase of leisure time among kolkhoz members and its rational use, especially in various regions, have still not been sufficiently examined. The interconnection and coordination of working and leisure time among kolkhoz members continues to remain sparsely analyzed. The study of this problem is important particularly as applied to the conditions of Uzbekistan, where agriculture has a group of specific features. We have made use of materials which investigate the budgeting of time by kolkhoz members in the Fergan valley of the Uzbek SSR, carried out during 1979-1980 in 12 kolkhozes<sup>2</sup> and including individuals who have worked for not less than 3 years. The trustworthiness of the selection is confirmed by the comparison of data from a selective and general aggregate (according to a series of indications). The composition as a whole was investigated identically in terms of education, basic profession, place of residence and real family income.

1. "Materialy XXVI S'yezda KPSS" [Materials on the 26th CPSU Congress], Moscow, 1981, p 137.

2. Investigations conducted by the laboratory of the Sector for Social Development Problems within Agroindustrial Collectives, under the chairmanship of Professor A. M. Amirov, corresponding member, UzSSR Academy of Sciences.

As is known, the structure of working and leisure time among agricultural workers depends first of all on the duration and intensity of work. For an analysis of utilization of working and leisure time among kolkhoz workers, it is necessary, in the first place, to consider the question of the duration of the kolkhoz members' working day and its regulation. According to the selective investigative data of the USSR Central Statistical Board, in 1965 workers in kolkhozes in the RSFSR were occupied in the public economy 8.2 hours per day, in 1972--8.0 hours per day; in the kolkhozes we selected in the Fergan valley, the figure was 8.5 hours per day. Actually, however, the duration of the working day varies according to the different professions of the kolkhoz members and according to whether they are women or men. There is a great variation in the work load among the various professional groups; this is observed during the course of the year as well. Thus, the yearly fund of working time is greater for animal husbandry workers than for field-crop workers--by 68-70 days, and 49-55 days greater than for machine operators. This is connected above all with the economic non-uniformity of kolkhoz peasant labor. The basic ways for its reduction are: first of all, diminishing the qualitative differences and intensity of labor; secondly, diminishing the gap in the magnitude of value, establishing a unit of time for each worker. These factors of interconnection also determine the expenditure of working time and its duration. Surmounting the groundless differences in duration of the working day and the extent of the yearly fund of working time demands a perfecting of the regulation of labor expenditure and an amelioration of its organization in the public economy.

In this connection it should be mentioned that existing norms in kolkhozes regarding expenditure of working time in man-days and man-hours are insufficiently substantiated and may not be taken into account for all types of specialties and variations in qualifications; essentially they are approximations, due to shortcomings in the organization of work and its stimulation. Under present conditions, the calculation of working time in terms of man-hours is growing in significance; this is most well-founded as a reflection of the tension of work. The resolution of this question will establish conditions for a more precise regulation of the daily routine, a reduction in different types of idleness and non-regulated breaks and, at the same time, will promote a precise calculation and economical expenditure of working time.

Conducting a calculation during the course of the year for working time expenditure by kolkhoz members in terms of man-hours is especially important for the institution of measures for future mitigation of seasonal variations in the duration of the working day of the kolkhoz peasantry. At the same time, such regulation will establish prerequisites for the amelioration of correlations between working and leisure time among different groups of kolkhoz members. As the data indicates, in the kolkhozes investigated in the Fergan valley of the Uzbek SSR during 1979-1980, working and leisure time was distributed very unevenly in periods of the year (see table).

**Distribution of Working and Leisure Time Among Kolkhoz Members Depending  
on the Seasons of the Year, According to Professional Groups  
(Hours Per Person on Working Days)\***

| <u>Periods of the Year</u> | <u>Machine Operators</u> |                     | <u>Animal Husbandry Workers</u> |                     | <u>Field-Crop Workers</u> |                     |
|----------------------------|--------------------------|---------------------|---------------------------------|---------------------|---------------------------|---------------------|
|                            | <u>Working Time</u>      | <u>Leisure Time</u> | <u>Working Time</u>             | <u>Leisure Time</u> | <u>Working Time</u>       | <u>Leisure Time</u> |
| Winter                     | 6.4-7.2                  | 5.5                 | 9.4                             | 3.3                 | 5.5                       | 5.3                 |
| Spring                     | 7.5-8.3                  | 4.5                 | 8.4                             | 4.1                 | 6.4-7.1                   | 4-5.0               |
| Summer                     | 9.5-10.3                 | 2.0                 | 9.3                             | 3.0                 | 11-12.3                   | 2.0                 |
| Fall                       | 0.5-10.0                 | 1.2                 | 8.5                             | 4.1                 | 13-13.5                   | 0.9-1.0             |
| Annual average             | 8.5                      | 3.3                 | 9.1                             | 3.3                 | 9.1                       | 3.2                 |

\*Table compiled on the basis of data from questionnaires.

The most unfavorable correlation of work and leisure time according to season, as may be seen from the table, occurred among machine operators and field-crop workers. It was in these professional groups that there was a sharp decline in leisure time in the summer-autumn period. As a result, possibilities for the kolkhoz members to increase their cultural and technical level are restricted, obstacles arise in their rational utilization of leisure time, difficulties are found in their use of various forms of active relaxation and the development of their personality is limited solely to the sphere of their labor activity. The situation that arises is, in many respects, determined by the seasonal nature of agricultural production and by limiting terms of application of concrete types of work. In our view, a more rational and complex adaptation of labor organization and technological processes to the particularities of development of crops and livestock permits a reduction in their negative influence on the distribution of work and leisure time and assures a change in the types of labor activity.

The seasonal nature of agricultural production is not the only factor that proves to have an influence on the extent of leisure time. Level of qualification, in particular, also has a great significance here. The data from the examination conducted indicate that with its increase, leisure time increases. Thus, machine operators and animal husbandry workers, who possess a higher level of qualification in comparison to field-crop workers, have, on the average, according to the investigation, more leisure time than field-crop workers. Aside from this, in these professional groups there is observed a significant difference also in the expenditure of leisure time on study and the raising of qualifications. In the first group this comprises 21.5-22.1 percent, while in the latter, only 9.0 percent. In our view, this is explained, in the first place, by the character of labor and the duration of the working day. The labor of machine operators and animal husbandry workers gives way to regulation. The investigated kolkhozes long ago introduced tables of calculations of the use of working time by machine operators, in which their time of arrival at work and departure from work is noted, cases of absence registered, etc.

According to the data of our investigation, the forms of leisure time utilization in various categories of the kolkhoz peasantry differ significantly. Thus, machine operators and animal husbandry workers engage more in activities of a creative type, while field-crop workers engage more in amusements. Such a difference, in our view, is, in many respects, determined by the lower level of mechanization in the labor of field-crop workers compared with that of machine operators whose level of development is greater in terms of social and cultural needs.

The rationalization of leisure time utilization demands, as is well known, an improvement in the work of social and other institutions. Until now, their work calls for a good deal of censure and this is supported by our investigation. An analysis of the data obtained indicates that 26.1 percent of kolkhoz members mention poor commercial service in kolkhozes, 33.8 percent express the desire to have places to hire cars in the village, 18.1 percent note the inadequacy of services provided by social service enterprises, 12.4 percent maintain that the work of kindergartens does not satisfy needs, 8.6 percent want rooms for children in movie theaters in the village, etc. The resolution of these problems will permit a significant increase in the effectiveness of leisure time utilization.

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LABOR

NUMBER OF PEOPLE WORKING AT HOME INCREASING IN LITHUANIA

Vilnius SOVETSKAYA LITVA in Russian 22 Jan 84 p 2

[Article by M. Stankavichyus, "Working at Home: An Economist's Observations"]

[Text] It is known that demographic processes lead to the gradual so-called aging of the population. Estimates indicate that in 1990 almost one in five republic residents will have the right to receive a state pension because of age. This is the practical realization of the right of citizens to economic security in their old age, as set down in the USSR Constitution.

Further development and improvement of the state system for social insurance is an integral part of the Communist Party's general course designed to continually improve Soviet peoples' prosperity. It is inseparably tied to the development of economics in our country. Living better means using the powerful scientific and technological potential that has already been created and mastering the new engineering and technology with more speed and energy.

Without man, however, technology is dead; people are needed to maintain it, and this, as they say, is where the problem comes in. While in the 8th, 9th and even the 10th Five-Year Plans it was possible to count on attracting extra workers to execute any plan, it is impossible at this time to count on this during a production intensification period. The work force situation has changed radically. During the current five-year plan, the growth of the working-age population has been more than cut in half, and during the next one it will be reduced by as much again. Under these conditions, it is particularly important for the public welfare to use the hands that have truly become golden through the work and life experience of veterans who are willing and able to continue working.

I anticipate gentle irony on the part of certain readers. The author is suggesting extensive attraction of pensioners to public production to solve the problem of the labor supply, they say. This would actually be naive to some extent, but let us look objectively at this problem and think it over.

Achievements in the field of health, improvement in labor conditions, the gradual shortening of the work week, the development of living comforts (housing conditions, personal and cultural service) have resulted in an increase in the time period of actual ability to work in the lives of most people, whether they be workers, engineers, employees or kolkhozniks. What about the right to an age pension, however? The official maximum for the working age remains unchanged--over 60. In this regard the number of pensioners who have fully maintained the ability to work at their own workplace or who could work at full capacity in easier production areas is constantly on the increase. According to data from various scientist-gerontologists, 8 out of 10 persons belong to this group of pensioners.

This is scientific evidence. Let us turn to the opinion of the retired persons themselves. The State Committee on Labor jointly with Vilnius State University surveyed pre-retirement age workers at 40 industrial enterprises in different sectors. We wanted to investigate their intentions for the future. It turned out that 60 percent of those surveyed wanted to continue working without leave and 15 percent after a definite break.

Those are the objective data. We would add to that a fact that has been established as irrefutable: the participation of retirement-age people in public production to the degree that they are able is not only an economic advantage, but also represents the social adaptation of man in society in a new capacity, filling his remaining life with meaning.

Let us return, however, to the problems of organizing the labor activity of elderly people. It should be mentioned that a great deal has been done in the republic in this direction in the face of overall shortcomings and difficulties. Approximately 45 percent of age pensioners are continuing to work in various sectors of the national economy. This is substantially more than in the country as a whole. In many collectives the intentions of people retiring on pension are ascertained ahead of time, and, if necessary, conditions are established for reclassification and they try to find easier work for them. This is good. Things are a little more complicated for those who for one reason or another leave their regular enterprise but wish to work at home or part-time. In this regard, this category of persons is not limited only to people of retirement age. It also includes women with children, Group III invalids, and finally adolescents and students wishing to start work.

There is, however, a way to do this here--organization of work at home.

At the present time there are more than 8000 persons in the republic who work at home. More than half of them work for enterprises in the Ministry of Local Industry, and they work extremely efficiently. Every year, 42-43 million rubles worth of various goods for popular consumption are produced in homes. Receiving centers and shops have been established for home workers by the ministry in 38 rayons; they handle almost 20 million rubles worth of products every year. Home labor sections of the Suduva Factory are expanding; new shops are being built in the cities of Palanga, Shyauliyay, Rokishkis, etc. Special repair brigades have been organized to improve the servicing of the technical facilities for home work.

The State Committee for Labor and the Ministry for Social Security of the republic approved and sent out to all interested ministries and departments recommendations for improving job placement, retraining and teaching occupations to pensioners and invalids. They give a representative list of occupations, specialties and duties recommended for substitution in a partial work day or work at home. In 1982, the republic Council of Ministers approved a plan of measures for expanding the use of home workers in 1983 for the production of goods for popular consumption.

It would seem that these documents should be able to help solve the problem. In many places, however, the situation as far as the use of home labor is concerned leaves a great deal to be desired. A typical conversation between workers and visitors at the Population Job Placement Bureau can be used to illustrate this: "I want to do some work at home." "Certainly, but let's see, do you have a knitting machine?" The conversation stops with this in most cases. At the same time, when a man goes to work at a plant, we do not ask him if he has his own required tool but if a man wants to work at home, then...Look at the data for Akmyanskiy Rayon. Here only the personal services combine has a program for allowing work to be done at home; in 1983, 3 people did this, in 1984 -- 3 more and in 1985 -- 4. Meanwhile, by May of last year, the rayon finance department granted 32 registration certificates for the right to engage in trade and 14 residents of the rayon center for the right of home workers to work actively at enterprises in neighboring Latvia.

There is food for thought there.

What is particularly surprising is that many economists place the blame on the "bureaucrats" from Gosplan, the TsSU [Central Statistical Administration], and Goskomtrud [State Committee for Labor and Salary], justifying the limited scope with which home workers' labor is used. They say that limits for the number of workers are established for an enterprise without counting home workers or part-time workers. But quotas for increased labor productivity are based on the actual number of workers, regardless of the fact that part of them work under nonproduction conditions or part time. This, however, is laying the blame at someone else's feet, so to speak. The number of home and part-time workers has not reached any kind of limit, and when labor productivity is calculated, their relative number is used, which is hardly able to make enterprise indices worse (see "Standard Instructions of the USSR TsSU On Worker and Employee Number and Salary Statistics," 1981). Therefore, it would seem to be very useful for all ministries, departments, associations and enterprises to give some careful thought to whether they have work which could be done by people at home, who would work either part-time or who would not be part of the permanent staff at all, charging them with work such as this. Existing laws and norms, and also various benefits are already allowing much to be done in this direction.

There are, however some unresolved problems here. I remember that a few years ago the Republic Trade Union Council and scientific and technological associations took the lead in developing facilities for small-scale mechanization, facilitating manual labor. Many interesting proposals were advanced. Many of them are being realized by production, on an industrial scale. Why not organize a similar contest and review for creating miniature workplaces and accommodations for work at home. It seems to me that popular skilled craftsmen, not counting the PKB [planning and design bureos], could offer much that is interesting for each sector. Following this, assimilation of their suggestions would be organized. In turn, republic Gosplan and Gossnab, along with interested ministries and departments, should consider the possibility of radically improving procurement of machines and apparatus currently available on the market for home production.

A shortage of sites for organizing shops, sections, reception centers, and transportation for raw material delivery and product pickup presents a serious obstacle to the expansion of home labor. Ministries and departments must solve these problems more energetically.

Finally, a search must be made for organized forms of home labor, for example, the creation of an association of pensioners under the aegis of social security agencies. A more flexible system for paying home workers, etc., is necessary.

Alternatives to labor do not exist in our society. Even the ancients valued the masters and creators above all else in man. The highest concept of life is labor. It ennobles man. Moreover, those goods--more than a million rubles worth--that can appear additionally on the counters of our stores as a result of well organized home and part-time labor would be useful to us at the present time.

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## LABOR

### BELORUSSIAN TRADE UNION CONCERNED WITH LABOR SAFETY

Moscow TRUD in Russian 24 Jan 84 p 2

[Article by N. Polozov, chairman of the Belorussian Republic Trade Union Council, Minsk: "Safety Feature: Belorussian Labor Unions Systematically Solve Problems of Improving Labor Conditions and Safety Procedures in Production"]

[Text] It is certain that the most important concern for any trade union worker should be the improvement of labor conditions and safety procedures. This is a problem of a comprehensive and universal nature. Moreover, to approach its solution it is necessary to take into consideration the fact that the final result of organizational, educational, or any other kind of work is directly related to the conditions in which a man carries out the most active part of his life--the working part.

Fairly often, however, specific questions of improving labor conditions and safety procedures are decided separately from problems of increasing its productivity, improving forms of organization and salary, or from competition, for example, to say nothing of the system of ideological, mass cultural and educational measures. Of course, all this does not mean that trade union committees must include measures for the creation of labor safety conditions in plans for this educational work. This would result in confusion and lack of worker responsibility.

It has become very clear today that more money is being spent for the creation of safe labor conditions and for reducing production-related injury and illness, but the efficacy of these investments is clearly still not proportional to expenditures. On the other hand, the need for more careful thought in the use of this large amount of money has presented the state and trade agencies with new problems. Perhaps the most complicated and most important of these is in planning improvement.

Even in the last five-year plan, purposeful and comprehensive programs were developed in our republic for mechanization and reduction in manual labor during the two years. As a result of its implementation, the number of workers engaged in manual labor in industry was able to be reduced by almost 30,000 men. The next step in this procedure was a scientific and practical conference presented by the Belorussian Trade Union Council and

the BSSR Goskomtrud [State Committee for Labor and Salary] in 1979: "Improving Labor Conditions--an Important Factor in Increasing Production Efficiency and the Wise Use of Labor Resources." The planning had a scientific and methodological basis at all levels, from enterprise to industry and republic.

There were, however, and still are several problems. The task proved to be extraordinarily complicated--there was essentially no experience for such planning, particularly long-term; indeed, even up until now there is not a lot of it. The matter is one of obtaining reliable information necessary for analyzing factors which have an influence on a man's health and ability to work in every workplace.

The Position on Carrying out Registration of Labor Conditions in Belorussian Enterprises and a Standard Passport of Sanitary and Technical Conditions and the Availability of Means for Labor Safety Procedures in the Shop (Sector), developed by the Belsovprof, Goskomtrud and the republic Minzdrav [Ministry of Health] are steps aimed toward overcoming these difficulties. These documents, approved in 1979, have become an effective guide to practical action right at the enterprises.

Belsovprof and BSSR Goskomtrud have exerted continuous control over the certification process, analyzing its results attentively. As a result, additions and changes guaranteeing plan workability have been introduced to the overall industry plans. Also an overall consolidated plan for the industries and the national economy of the republic as a whole has made its appearance. Audits as to its implementation, and there have already been more than ten of these, have become specific. I am going to present several figures for a graphic representation of the scale of the changes planned for the current five-year plan. Thus, the number of people working under unfavorable conditions in industry production is planned to be reduced by 50 percent, in construction by 75 percent, transportation and communications by 60 percent, and in nonproduction areas by 85 percent. The number of workers engaged in heavy physical labor must be reduced by 43 percent. The limits are attainable and lofty, but what has already been achieved during two years of the five-year plan indicates that they were calculated correctly and will be adopted. Proof of this is that labor conditions were brought to the norm for 250,000 men, a result surpassing the plan.

How and on what account was this achieved? It is clear that certification and planning are the preliminary processes, although attainment of the final result depends directly on their level and quality. It is possible, nevertheless, to do a good job of certification, give the plan a scientific basis and...not to fulfill it. We have examples of cases such as this. This usually happens when problems of improving labor safety procedures and conditions are handled formalistically, as they had always been done in the past. In contrast, where they are made to depend directly on increasing production efficiency as a whole, success is inevitable. An example of this is the experience of the collective at the Borisovskiy Plant for Motor Vehicle and Tractor Electrical Equipment, gained when they made a transition to brigade and cost accounting forms of labor organization and salary.

An investigation of work areas for determining labor conditions and every unfavorable factor went on at the plant for 6 months. Trade union activists participated in this work together with the specialists. As a result, a complete and precise picture was obtained. The labor safety procedures agreements, an integral part of the overall plan, were specific and feasible. At the plant, production is constantly being updated from a technological standpoint.

It is known that brigade cost accounting provides for a number of supplementary payments, including those for labor conditions at the workplace. They are not profitable for the enterprise. It is more advantageous to improve the labor conditions themselves. Thus, brigade cost accounting creates a system whereby enterprises have a direct economic interest in the solutions to these problems.

A great deal of attention is also being given in the republic to the adoption of a system of labor safety standards. Specifically, standardization draws a unique safety line, and crossing it means breaking state or interproduction law. Belsovprof and the Gosstandart [State Standards Committee] republic administration worked out the appropriate recommendations in order to give procedural help in adopting labor safety standards to enterprises. Enterprise standards are being developed and adopted today in many production associations in conjunction with state associations. Combining them makes it possible to create a system for administering labor safety within the framework of the plant or association.

Work such as this is being actively carried out and is bringing tangible results in the Mogilev Khimvolokno Association and the Strommashina Plant, at the Minsk Tractor Plant, at the Gomel Torfmash Plant and the Machine Tool Plant imeni Kirov, at the Novopolotsk Polimir Production Association and many others. Today, more than 80 percent of republic enterprises and organizations have begun to adopt labor safety standards.

The quality of this work disturbs us, however. In many cases a check of republic trade union committees reveals a formalistic approach to the development and adoption of standards, as well as deviation from clear methodical principles. On the whole, development of standards far outstrips their adoption. As a result, a situation develops which does not at all encourage an attitude of respect toward standardization. Judge for yourselves. At the present time, there are over 600 standards in existence with the formidable warning that nonobservance of them is prosecuted by law. At present, however, out of this large number just a few have been adopted and are being observed.

In addition to subjective reasons, there are also a whole raft of objective ones slowing down the process of the adoption and observance of existing standards. Difficulties with material and technical procurement are the most important of these. A substantial change in technology and modernization or substitution of equipment are often required, and this is related to substantial expenditures of money and material resources. The Minsk Tractor Plant needed 170 tons of paint, for example, for adoption

of the standard, "Signal Lights--Danger Signs." Resources are not allocated to the plant for these purposes, nor are there internal resources.

In my opinion, this is the result of the overall gap between the importance of the tasks and possibilities for their implementation. I have in mind a situation that has been in existence up until now, according to which overall plans for improving labor conditions are not introduced in a special section to the plans for economic and social development of enterprises and sectors of the national economy. Up until now, the corresponding recommendation of the VTsSPS [All-Union Central Trade Union Council], recorded in the decree of 15 May, 1981, has not been realized. Up until now, state statistical reporting of the implementation of overall plans for improving labor conditions has not been established. The form for reporting approved by order of the BSSR TsSU [Central Statistical Administration] in 1980 bears a departmental character and is presented by enterprises only to the higher economic and trade union agencies. If these problems were solved, the efforts launched by trade union agencies in cooperation with state agencies would prove to be more effective.

It would however, be radically wrong to sit idly by and wait. We are trying to provide a system and sequence in work on improving labor conditions and safety procedures, particularly with the broad attraction of society to it. Last year, for example, as the result of a review of the automation of heavy manual labor in which more than a thousand social committees and sectorial NTO [Scientific and Technical Society] sections participated, uniting more than 13,000 specialists and as a result of the adoption of the suggestions that they offered, approximately 2,000 men were released from heavy manual labor; the economic effect was more than 25 million rubles.

As we see, the work is being carried out in various directions. It will become more and more systematic and will increasingly conform to the plan.

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CSO: 1828/103

## EDUCATION

### DIRECTION, QUALITY OF ENGINEER TRAINING DISCUSSED

#### 'Traditional' vs. Modern Training

Moscow SOVETSKAYA ROSSIYA in Russian 5 Feb 84 p 1

[Article by Georgiy Kulagin under rubric "Reflections of a Current-Affairs Commentator": "An Engineer of the 21st Century"]

[Text] Attempting to imagine the appearance of an engineer in the 21st century, I tried at first to compare a present-day engineer with his colleagues at the beginning of the 20th century, who were still wearing a uniform cap with little hammers and who were very proud of their title. In my youth I still managed to encounter among the living various representatives of that small but active tribe, which had drilled tunnels in the mountains of the Caucasus, thrown a bridge across the Volga, laid the Great Siberian track, set our country's metallurgy on its feet, designed and built the first hydroelectric power stations, and created the world's best steam locomotives and cannons.

I had been fortunate enough to see at work the builder of hydroplanes, Dmitriy Pavlovich Grigorovich; metallurgist Ivan Pavlovich Bardin; and shipbuilder Aleksey Nikolayevich Krylov; all of whom, despite their many honorary titles, considered themselves to be -- and actually were -- first and foremost, engineers. Subsequently, fate brought me together with that brilliant representative of the first generation of Soviet engineers, that true leader of our country's and the world's technology, Sergey Pavlovich Korolev. I must say that both he himself and his talented assistants, in their work style and their grasp of the problem, to a large degree were similar to their teachers and predecessors. Of course they were the figures at the pinnacle of their era, and one should compare the average levels. But, however one compares, the conclusions that one has to make are by no means always in favor of the present-day engineer.

They can be formulated briefly as follows: the engineer in his uniform cap knew immeasurably less than our contemporary, but that which he knew, he knew well, but, most important, he was not so much a bearer of knowledge as a doer who persistently brought his ideas to their practical realization. In addition, he had a greater mastery of such qualities as intuition, the "engineer's eyeball measurement," and the sense of personal responsibility.

I might be reproached for failing to understand the present-day nature of technical creativity. People might point out to me that the age of the "lone

wolf" creators has long since passed and that nowadays the new technology is created by collective efforts. But I actually cannot understand how, in a particular NII [scientific-research institute] or KB [design bureau], hundreds of engineers work for a dozen or so years in a row on projects that "go onto the shelf," and are not indignant, are not particularly anxious themselves to see their work "in metal." I am embarrassed when a young engineer engaged in the designing of cranes, a person with an excellent mastery of the technique of making computations, cannot, by eye, distinguish between a 20-ton hook and a 50-ton one. Two bridges across the Neva are situated almost next to one another. One of them -- the Bol'sheokhtinskiy Bridge -- was built 70 years ago, but its drawbridge span continues to work perfectly without any major repairs. But the Aleksandr Nevskiy Bridge is not yet 10 years old and this is already the third year that its draw span has been in a permanent state of repair and "modernization." The old engineer, it seems to me, made mistakes less frequently.

Therefore, before speaking about the engineer of the future, it is necessary to analyze seriously what has been acquired and what has been lost by today's engineer. It would seem that the problem is not so much about the obsolete programs of instruction as it is about the fact that, as the engineering profession is converting into a mass profession, we are training a surplus of engineers, in accordance with the principle "it's cheaper by the dozen."

Let's begin by stating that it is by no means everyone who can become a good engineer: it requires vocation, in the same way that a vocation is needed to become a performing artist, painter, physician, or teacher. The search for one's student is, undoubtedly, an important matter, but it should not be replaced by something that is directly antithetical to this task--the luring of any matriculating students to the so-called "rabfaks" [worker departments] which, by the way, do not anything in common with real "rabfaks," but do guarantee to anyone who desires it the almost uncompetitive admission to an institute.

I am convinced that without high competitive selection upon admission to an institution of higher learning you will never train a good engineer (I am not discussing here the principles that govern the selection itself). And yet the competitions for admission to engineering institutions of higher learning, as everyone knows, have been falling and falling from year to year. Because it has happened like this: young people reacted much more quickly and correctly to the overproduction and devaluation of the engineering diplomas than the Ministry of Higher and Secondary Specialized Education and Gosplan did. The way out, one would think, lies in reducing the admission to most of the engineering institutions of higher learning, in the intensification of the process of selecting out the incapable and remiss students in the process of instruction, and in the issuance of diplomas in various categories in conformity with the actual successes achieved by each diploma recipient. It is necessary, in parallel, to carry out more decisively the reduction of the swollen staffs at the NII and KB and the technical services at plants, and thus achieve a substantial increase in the salary paid to those who are executing truly engineering work.

I know that many workers at institutions of higher learning will object to what I have said, saying that we do not have any overproduction of engineers, since many of the administrative positions at the enterprises are occupied by practical workers who do not have diplomas. I am convinced that this fact only

confirms the reverse situation. First, a young engineer, as a rule, has not been trained for the role of a low-level administrator of production, and, secondly, it is there that he is needed least frequently.

I would like to support decisively the opinion of the Prorector of the Novocherkassk Polytechnical Institute, A. Nikitenko ("Who Will Accept an 'Unfavorable' Topic?", 28 December 1983) concerning the need for the sharp intensification of the scientific-methodology work in the institution of higher learning, as the basis for improving the educational and indoctrinal process and the chief means of increasing the academy's rate of activity and developing the creative thinking of the future engineers. Even my small amount of experience in instructor work has convinced me that the serious misfortune of the institutions consists, on the one hand, in the attempts to encompass the unencompassable, following any fashionable breeze that blows, and, on the other hand, in the excessive autonomy of certain departments and their weak interaction with one another.

Something else that requires major change is the system of manning the instructor staffs. Today's standard path is postgraduate work, the defense of a candidate's and doctoral dissertation, the awarding of the rank of professor. That path is good for the purely theoretical disciplines in the physical-mathematical cycle. But one can scarcely consider it suitable for such engineering sciences as the technology of processing metals, machine parts, machine tools, or the organization of production. The people who should be attracted to teach those disciplines should be experienced engineers from production, assuming, of course, that they possess pedagogical talent, or those young people who, after being accepted for postgraduate work, will be engaged in prolonged practical work as a designer, in a laboratory, in a shop, in real-life engineering positions, and who will also receive favorable reports about their work.

Another idea that deserves support is the one concerning the intensification of the instruction of the fundamental disciplines, especially during the first years of instruction, in order to develop the student's ability to think broadly and independently and to work constantly to assimilate that which is new. At the same time, in the senior years one should deepen and even narrow the specialization, possibly by means of transferring the concluding stages of instruction and the work on the student's diploma project directly to the enterprises and institutes where the young specialists will be working.

The time has also come to divide the students in the senior years, depending upon the preferences that they have shown, into two streams: those who will be working in KB and laboratories, and those who will become organizers of production. For the latter group one should intensify the instruction of such subjects as the administration of production, planning, the study of the market and the providing of services to the customer, labor legislation, and social psychology.

Of course, the curricula should be regularly renewed. But before crowding out the "information from our grandfathers" and replacing it with the most "moderne" information, it is necessary to analyze very carefully what really is new knowledge and what is fashionable but short-lived innovations that only clutter up the informational field. I cannot agree with the popular but not very convincing assertions that in our age there has been an unbelievable

acceleration in the process of obsolescence of knowledge and the volume of scientific-technical information today doubles every ten years, and soon will double every year and a half. The number of true discoveries by no means grows exponentially, and they should not be confused with the number of published articles, which, to use the apt expression of the British satirist, Parkinson, "during our age of universal semiliteracy" has actually burst its banks.

Today communication with an electronic computer is a "second literacy," and tomorrow's engineer must be in mastery of an electronic computer just as freely as yesterday he was in mastery of his slide rule, and he must know how to use a "data bank" just as easily as in the past he used the <sup>"</sup>Hütte reference book.

It is also true that an engineer must be not only a skillful "user" of information systems, but also an "assigner" of tasks. But one can scarcely consider it to be correct to require each engineer to become a skilled "developer" -- for a long time to come, this will be a job for specialists in information theory.

However, as we are justifiably warned by President of the USSR Academy of Sciences, Academician A. Aleksandrov, broad measures for eliminating computer illiteracy "must be preceded by work to unify the technical means and software. This question is of primary importance. Without its precise and intelligent resolution, all attempts to computerize our national economy will result only in tremendous useless expenditures."

Great opportunities are provided by ASU [automated control systems] and SAPR [computer aided design systems], one should not overexaggerate ones belief in their omnipotence. Even where we are talking about a fundamentally new technology that is based on an invention or a primary, pioneering application of new discoveries in a fundamental science, it will still be necessary in the 21st century, as it was during our grandfathers' time, to have a talented human head.

Probably some of the ideas expressed in this article are the reflection of the conservative views that are in keeping with the author's age. However, I am convinced that even in the distant future the triune formula "know-want-be able" will correctly reflect the requirements made of a specialist. And if this is so, then, in the training of engineers we should not limit ourselves to putting the main pressure on the increase in knowledge. It is no less important — if not more important — at this stage to intensify the attention to the development of those qualities that are reflected in the second and third terms of the formula that has been cited.

#### Need for Fundamental Knowledge

Moscow PRAVDA in Russian 3 Feb 84 p 3

[Article by A. Prokhorov, academician secretary, Department of General Physics and Astronomy, USSR Academy of Sciences, and R. Sagdeev, academician, chairman of Scientific-Methodology Council for Physics, USSR Ministry of Higher and Secondary Specialized Education, under the rubric "Problems and Judgments": "How Could an Engineer Do Without Physics?"]

[Text] Developing in close contact with technology and being its foundation, physics has penetrated into practically all areas of industry, creating the

very possibility for the emergence of many of its new branches. Deep within the "bowels" of physics laser and air-space technology were born, as were holography, radio electronics, optical electronics and cryoelectronics, nuclear power engineering, etc.

As is well known, the present-day status of the fundamental sciences determines the level of technology: new ideas cannot make a statement about themselves within the confines of the customary ways and methods. For example, the use of lasers to cut materials has already made it possible to bring to a previously unattainable level the methods of obtaining high-precision parts with a complicated configuration. Plasma processing of the surface guarantees a considerable improvement in the quality of the cutting tool. In the area of communication, vast prospects are promised by the assimilation of the optical band, which is, once again, based on the application of various types of lasers and fiber optics.

However, the transition in the national economy to the progressive technological and design decisions that are obtained on the basis of fundamental research frequently is occurring at an inadmissibly slow rate. In addition to the departmental barriers and insufficient coordination among the individual links in the economic mechanism, this is influenced, to a considerable degree, by the poor connection between fundamental and applied science, by the fact that in production and even in many branch institutes there is frequently an insufficiently thorough understanding of the ideas and methods of physics on which these innovations are based.

Dwelling upon the peculiarities of the present-day stage of the scientific-technical revolution, Comrade Yu. V. Andropov remarked in his statement at the December 1983 Plenum of the CPSU Central Committee, "Much will depend upon the manner in which we mobilize for the acceleration of scientific-technical progress the collectives at the enterprises, scientific-research and design organizations, and the engineer-technical and scientific cadres. This is a task of primary importance."

The resolution of that task, in particular, requires the labor collectives and the coworkers at enterprises to strive to give themselves, and to be able to give themselves, fundamentally new tasks. This, in its turn, is possible only in the event that the specialists possess good training in the area of the fundamental sciences and the ability to keep learning and relearning. The fact of the matter is that, under conditions of the accelerated development of technology, the amortization of the achievements of the specific special areas of knowledge occurs very quickly.

Hence what becomes one of the chief requirements is the requirement of the professional mobility of the specialists. As applicable to education at institutions of higher learning, this means that the emphasis must be made upon the fundamental nature of training. Its basic principle is most frequently formulated as follows: "the directed area of specialization on a broad base."

It is well known that specialists who have received sufficiently broad physical and mathematical education acquire the ability to "think in terms of physics," can independently assimilate new technical trends, work successfully in them, make the transition easily from the resolution of some tasks to the resolution of others, and seek untraditional paths, although, to use student's

language, they "never took" any subjects like this when they were at an institution of higher learning.

In principle the need for a knowledge of physics by specialists in the area of technology and the natural sciences does not cause any doubts on anyone's part. But the question about the volume of that knowledge remains a moot one. And so long as a dispute exists, one observes a completely clear-cut tendency toward the reduction in the number of hours set aside for the general physics course. For example, in the higher educational institutions in the field of construction that quantity has dropped from 300 hours in the late 1960's to 204 in 1983. The same thing is occurring in the chemical-technological institutes and the higher educational institutions specializing in the area of railroads and machine tools and tool building. At the Moscow Institute of Electronic Technology in the late 1960's the general physics course consisted of 424 hours. Five years later the course was reduced to 374 hours, and by the late 1970's, to 340. In the new curriculum a total of 306 hours are allotted to this course.

True, in this institute, as in certain others, the students also study a number of branches of theoretical physics and special courses. But that does not mean at all that what has been lost by reducing the general course is somehow compensated for. Whereas in 1967 the number of hours devoted to the study of all branches of physics here was 789, in 1983 that total is only 458. There is no way by which the improvement of the teaching process can compensate for these losses.

The situation is further aggravated by the fact that there has been a sharp reduction in the amount of time set aside for the practical classes and the resolution of tasks. Without that the best that one can do is to memorize the basic principles of physics, but one can scarcely learn how to use them.

The representatives of the specializing disciplines at the higher educational institutions are inclined to adhere to the point of view according to which the ideal way out of the situation would be the corresponding "specializing" of the physics course, as well as the giving of lectures in its individual branches in the special departments. Putting it more simply, we are discussing teaching our future doctors "their kind" of physics, and construction specialists "their kind," obviously, in truncated volume. Usually the reason given for this is that specialists in the technological fields know better what an engineer in the specific area of specialization will need from physics. This point of view seems to us to be completely untrue. A consequence of this will be not only the breakdown of the overall logic of instructing physics as a science, all the branches of which are harmoniously interrelated, but also the insufficiently skilled exposition of the corresponding branches by instructors who have not had professional physical-mathematical training.

Unfortunately, such experiments have already been carried out. They have brought the lowering of the level of instruction of physics at the institutes that have taken that path. As a result there has been a loss in the fundamental nature of the engineering education, and the emphasis is made upon the unproven training of specialists in a narrow -- sometimes too narrow -- area of specialization.

We would like to dwell upon another, no less important factor. In our country's scientific potential, the higher educational institutions play a role of no

small importance. A considerable number of discoveries, inventions, design resolutions, and progressive technological schemes are born within the walls of institutes, and the total number of their departments constitutes, as it were, a scientific-research institute of a rather broad area of specialization. And just as applied science, as a whole, is incapable of developing if it is not fed with the successes of the fundamental sciences, science at the higher educational institutions cannot move ahead sufficiently rapidly without relying upon a good general-scientific base. Unfortunately, the depressed state of the fundamental departments -- and primarily the general-physics departments -- at many higher educational institutions has led not only to a lowering of the level of instruction and the role of those departments in the overall progress of science at the higher educational institutions, but also has frightened off many of the leading scientists at the academy and branch scientific institutions from collaborating with the higher educational institutions.

The result and most important goal of higher education is the obtaining of a general scientific idea about nature and the methods of gaining perception of it. It is not by accident that we speak not simply about the training of specialists in a particular area of specialization, but specifically about higher education. The understanding of the present-day physical picture of the world is one of the foundations of scientific Marxist-Leninist political philosophy. The classic authors of Marxism-Leninism repeatedly extracted from physics brilliant examples that confirm and deepen the absolutely fundamental philosophical principles. How can one fail to recall V. I. Lenin's words, "From living contemplation to abstract thinking, and from it to practice -- that is the dialectical path of the cognition of the truth, the cognition of objective reality." This very important principle in the theory of cognition, a principle that directly emphasizes the primary nature of fundamental knowledge, is disregarded when the role of physics is lowered in institutions of higher learning.

Without a doubt, the very process of instructing physics in the higher schools should be improved both in its direction and its scientific and methodological level. No one will remove from the physics departments the responsibility for the overall state of affairs. But they have proved to be in the minority when developing the curricula, and frequently have not even been involved in discussing them. The USSR Ministry of Higher and Secondary Specialized Education has not been putting up any opposition to this practice and has been ignoring the opinion of its own scientific-methodology council on physics and the USSR Academy of Sciences. We might add that the new program for the physics course for higher technical educational institutions, which was approved by the USSR Ministry of Higher and Secondary Specialized Education and takes into consideration the role of this science in the training of engineering cadres for the national economy, cannot be implemented under conditions of a reduction in the number of hours allotted for the instruction of that course.

Many of the shortcomings that we have been discussing have their beginning in the secondary school, where as everyone knows, the quality of the physics textbooks and the instruction methodology itself are frequently far behind the present-day requirements. We sincerely hope that this circumstance will be taken into consideration in the final version of the basic directions of the school reform, which are currently being discussed, and that practical steps will be taken to assure that this important subject occupies the place that it deserves

in the formation of modern knowledge in the persons who are graduating from the secondary schools.

An engineer works in a world where everything is determined by the natural laws that underlie physics. Physics is that scientific base upon which, in the higher schools, it is necessary to construct general-engineering and special training. The studying of the principles of physics is the most desirable and most economical form of assimilating the knowledge and practical skills that are needed under the conditions of the scientific-technical revolution.

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## EDUCATION

### PRAVDA STRESSES STUDENT EDUCATIONAL RESPONSIBILITIES

Moscow PRAVDA in Russian 4 Apr 84 p 1

[Text] Student years are a special and critical time in the life of millions of Soviet young men and women. This is a time for the active accumulation of knowledge, occupational skills and experience, a time for the coming of age of ideas and the development of clear ideological and civic positions. Under the guidance of scientists and experienced teachers, yesterday's schoolchildren, young workers and kolkhozniks, and soldiers returning from military service, learn in several intense years of study how to solve complex scientific and technical problems, how to heal sickness and disease, and how to lead schoolchildren along the paths of knowledge.

The labor of studying, deliberate and rich with searches for professional truths, is difficult. At the beginning it is difficult for first and even second year students to relate the fundamental tenets of the theoretical and social disciplines to the type of occupation that they have chosen for themselves. Indeed, it is in these very first two years of VUZ study that the foundation of knowledge enabling a specialist to independently orient himself to the ever-growing stream of scientific and technical information is laid.

A good tradition exists in the country's better VUZes: first year students are handled strictly but carefully, with attention. The experience of the Azerbaijan Petroleum and Chemistry Institute is representative. Here collectives of the appropriate departments come to the aid of novices from the very first days; curatorship of academic groups is entrusted to the most experienced professors and instructors of special disciplines. They help students to cope with an unfamiliar way of life and study form, acquaint them with the character of their future specialization, teach the method and experience of working with literature and the skill of carrying out their studies independently. The efforts of the teachers are repaid by the successes of their charges: they rapidly find confidence in their abilities, successfully pass examinations, and become an active part of social life at the institute. It is significant that this VUZ loses almost no students along the difficult road to a diploma.

Other kinds of examples also exist, however. For example, students at Alma-Ata Energy Institute this past autumn were not able to begin their classes until the 20th of October, for various reasons. The educational road for many first year students began with remodeling rooms in dormitories. It is not accidental that student dropouts here have been steadily growing in recent years. Facts such as this cannot be tolerated. Rectors, party committees, Komsomol and trade union organizations of higher education schools must be responsible for creating all conditions necessary for the effective teaching of students in the younger courses, and must help them become a part of the social life of the student collective.

Curiosity, a thirst for what is new and a desire to overcome difficulties are natural for young people. The majority of VUZ pupils have a conscientious attitude toward their studies, willingly assimilate research experience, and undertake the development of the specific production orders. Student space satellites, modernized enterprise shops, living quarters and public buildings erected by future architects and builders according to their own plans are evidence of this. In the student milieu, cases of infantilism still come up, well beyond the years of early thrift and pragmatism. Some leave the VUZ on the eve of their diploma work "on their own", refusing to be assigned, so that they can settle "more advantageously." Communists and VUZ Komsomol organizations must not overlook cases such as these, and must make an effort to see that each student takes care of the honor of his name and professional reputation and is ready to carry out his social duty.

National discussion of the basic directions of the proposed reform of the general education and occupational schools is also opening up rich opportunities for improving the work of VUZes and the training of specialists with a higher education. Improvement in rules for admission is planned, along with expansion of the social base for the formation of student quotas and an increase in responsibility and conscientious attitude of young people toward receiving a higher education. The USSR Minvuz [Ministry of Higher and Secondary Specialized Education], rectors, and party organizations of universities and institutes must carefully study the proposals made in the course of discussion of the CPSU Central Committee plan for school reform and must plan methods for its realization.

An important role in the process of forming the personality of a future engineer, physician, agronomer or teacher belongs to the tried-and-true form of education known as student government. The procedure at Tashkent University, Lvov Polytechnic Institute, Moscow Higher Technical School imeni N. E. Bauman, and the Latvian Agricultural Academy where student study and educational commissions, councils on scientific and research work and dormitory councils are active, is highly recommended. The opinions of students on solutions to a wide circle of problems are considered, starting with the enrollment of first-year students and ending with work assignments for graduates. In certain VUZes, however, self-government principles are replaced with troublesome guardianship or the net result merely becomes self-serving. Sometimes, students are involved in managerial affairs that are removed from their specialties, correcting the flaws and mistakes of others. Thus students in different classes at Leningrad Engineering and

Economics Institute skipped up to a fourth of the lectures and seminars because of their continued distraction with "everyday business" at the VUZ.

Every student day is special. Right now many VUZ graduates are defending their diplomas and getting ready for their arrival at the labor collectives to which they have been assigned. Their junior colleagues also have their responsibilities: the examination period is at hand, and then the summer semester, when the patriotic movement of student construction detachments will be a quarter of a century old. Rectors, VUZ party committees, and Komsomol leaders must help the young enthusiasts and control the progress of preparations for a working summer.

The title of Soviet student is an honorable one. It imposes rigorous responsibilities, however. Let everyone who is today approaching the peak of his studies fulfill his duty with dignity, encountering the support and understanding of his mentors in his endeavor.

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## EDUCATION

### SIBERIAN EDUCATOR URGES VUZ-INDUSTRY TRAINING COORDINATION

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[Article by G. Kutsev, rector of Tyumen State University, professor:  
"The Siberian Account: Higher School—Order for a Specialist"]

[Text] Everyone knows what a progressive role in filling personnel orders is played by direct contractual relationships between the VUZ and enterprises. Advantages are mutual: the client obtains a young specialist already acquainted with the character of work awaiting him. In turn, the VUZ can structure its teaching process more precisely and can guarantee valuable production experience to students, and the economic assistance of the industry is also very helpful. The higher schools have a versatile planning instrument, enabling them to avoid lack of proportion in training qualified personnel for various specialties.

Our university has a great deal of experience in operating through direct relations. Agreements have been made with 50 central boards of the West Siberian oil and gas complex, major industrial enterprises, and scientific and research institutes. Schoolteachers and instructors for secondary occupational and technical schools in the oblast are trained according to an agreement with the oblast national education department and the occupational and technical education administration. This required us not only to make regulation adjustments in the VUZ plans, but also to organize new specialties.

It is true that in contrast to other VUZes, we often do not have to find clients for our graduates--they make their way to the universities themselves. The rapid development of production forces in the region has required a large number of specialists. Thus, in the remaining Tyumen higher education schools more than 90 percent of our graduates are working at organizations and enterprises of the West Siberian territorial and production complex. Nevertheless, only half of the demand for young staff is being met in this manner.

It would seem in a similar situation that we should not experience difficulties in choosing a workplace for our students. Actually, from year to year every graduate of the biology department day school gets almost 2 requisitions. There is just about the same demand for chemists. Here is the paradox, however: in interdepartmental distribution plans for these departments the "Undetermined Destination" column is not empty. In other words, although they are awaiting specialists in a good ten organizations, documentation confirms that this may not be the case in practice.

Certainly none of these unsuccessful students is in danger of being out of work. The student must simply use his "direct connections", and sometimes those of his parents, so as to have the "paper" indicating a specific job waiting for him by assignment time. Of course, we first try to meet the demands of enterprises and organizations with whom we have contractual relationships. However, inasmuch as such directions are accidental and gaps remain in the plan, the Minvuz [Ministry of Higher and Secondary Specialized Education] begins to think: why not lower admissions to departments whose graduates are not enjoying popularity?

What is the point here?

The reason is probably because the system for planning the preparation and assignment of specialists is not being linked up with the practical direct VUZ-enterprise agreements that are becoming widespread. The mechanism of plan formation that has existed for a long time is cumbersome and consists of many stages. First the requisition is drawn up in the department or sector, then it is considered at Gosplan and sent to Minvuz. It is not accidental that errors and discrepancies in plans for the training of personnel are more readily observed in those very rayons where major national economic complexes have been newly adopted and formed.

One does not need to go far for examples. Thus, our university is ready to assign its entire body of graduates by direct agreement alone, but the RSFSR Minvuz has given permission to assign only 40 graduates of the economic department and 10 of the chemistry department according to personnel agreements--only a tenth of those to whom we will be awarding specialists' diplomas.

Glavtyumen'neftegaz [Tyumen Oil and Gas Main Administration] continues to develop at a very rapid rate. The central board can serve as the client for dozens of VUZes: its annual requirement for young specialists numbers in the thousands. We estimated the capabilities of the university and concluded an agreement to send 46 mathematicians, physicists, chemists and economists every year to organizations and scientific and research petroleum worker subdivisions, but only 16 are permitted by the plan. It needs to be said that the central board in the meantime is fulfilling its responsibilities: it gave support for the consolidation of the material base, is acquiring educational equipment for us, and is finding sites for practical production experience for students. Why, then, is the ministry slow in correcting the plan, with an adjustment that will only facilitate matters?

The clumsiness of centralized planning in the higher school leads sometimes to absurd discrepancies. In 1979, the university received a republic Gosplan letter and an order from the republic Minvuz concerning the training of 15-20 ichthyologists every year at the biology department for the Sibrybeprom Association. The rectorate set up a Department of Hydrobiology and Ichthyology and outfitted educational and scientific research laboratories. An agreement was signed between the association and the SibNIIrybprojekt Industrial Scientific Research Institute. However, when it came to the assignment of young specialists, it turned out that the RSFSR Ministry of the Fishing Industry, at whose request the specialty had been set up, was missing from the plan. University workers had to draw up all the preliminary documentation: requisitions, agreements, principles. Finally, it was observed that the ministry formulated an order for ichthyologists--specialty number 1013, and the university was graduating biologists--specialty number 2019--with a specialty in ichthyology. It needs to be mentioned that bureaucratic clumsiness such as this would not develop if assignments were based on direct communications.

It is not difficult to foresee objections on the part of opponents, that Tyumen VUZes nonetheless cannot handle provision of young specialists to the region from their own forces, since they have a weak material base and graduates will need to be sent there from other rayons of the country. And so this "transportable" product from the higher school--how is it to be handled?

Scientists at our university analyzed motives for young specialists coming to new cities of the Tyumen north, their future life plans. The following judgments were made among graduates of Tyumen VUZes: one out of three cited interest in work and prospects for professional growth; for one third it was an attempt to obtain living quarters. Salary took first place among specialists from other rayons of the country; living quarters held little interest for them. Thus, the majority intend to work the "prescribed" 3 years and return home. Only 1 in 7 of Siberians, e.g., in Novyy Urengoy are directed to a phase of their lives such as this.

One unequivocal conclusion can be drawn: the more specialists that are drawn away from their native area, the more difficult it is to consolidate personnel and reverse migration is higher. It is economically and socially sound to train about half the engineers, physicians and teachers from the ranks of local youth.

Meanwhile, at the present time our oblast holds one of the last places in the Russian Federation as far as the number of students per thousand of the population, and a serious discrepancy can be observed here: young cities are growing before our eyes; the number of secondary school graduates is continually growing. At present, however, they have to leave their native areas. It is indeed a shame that these same people are related to the future of Siberian science, industry, public health and education.

Even if the personnel problem was of a local, so to speak Turkmen nature, then it would be worthy of solution, but these same problems are

encountered everywhere that massive construction is in full swing and major territorial-production complexes are being formulated.

It appears that for VUZes of those regions where there is a high demand for personnel because of the rapid development of production forces, it would make sense as an experiment to allow full assignment of its graduates based on contractual agreements with clients. "Direct communication" would make it possible to provide an actual basis for making admission plans more exact, as well as programs for goal training of specialists. It would also allow educational institutions to react sensitively to changes in personnel requests from their clients.

Nonstandard solutions are necessary for nonstandard situations. This includes a special strategy for the development of higher education and consolidation of its direct connections with life and production.

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